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Construction Methods

McGraw-Hill Publishing Company, Inc.

March, 1936

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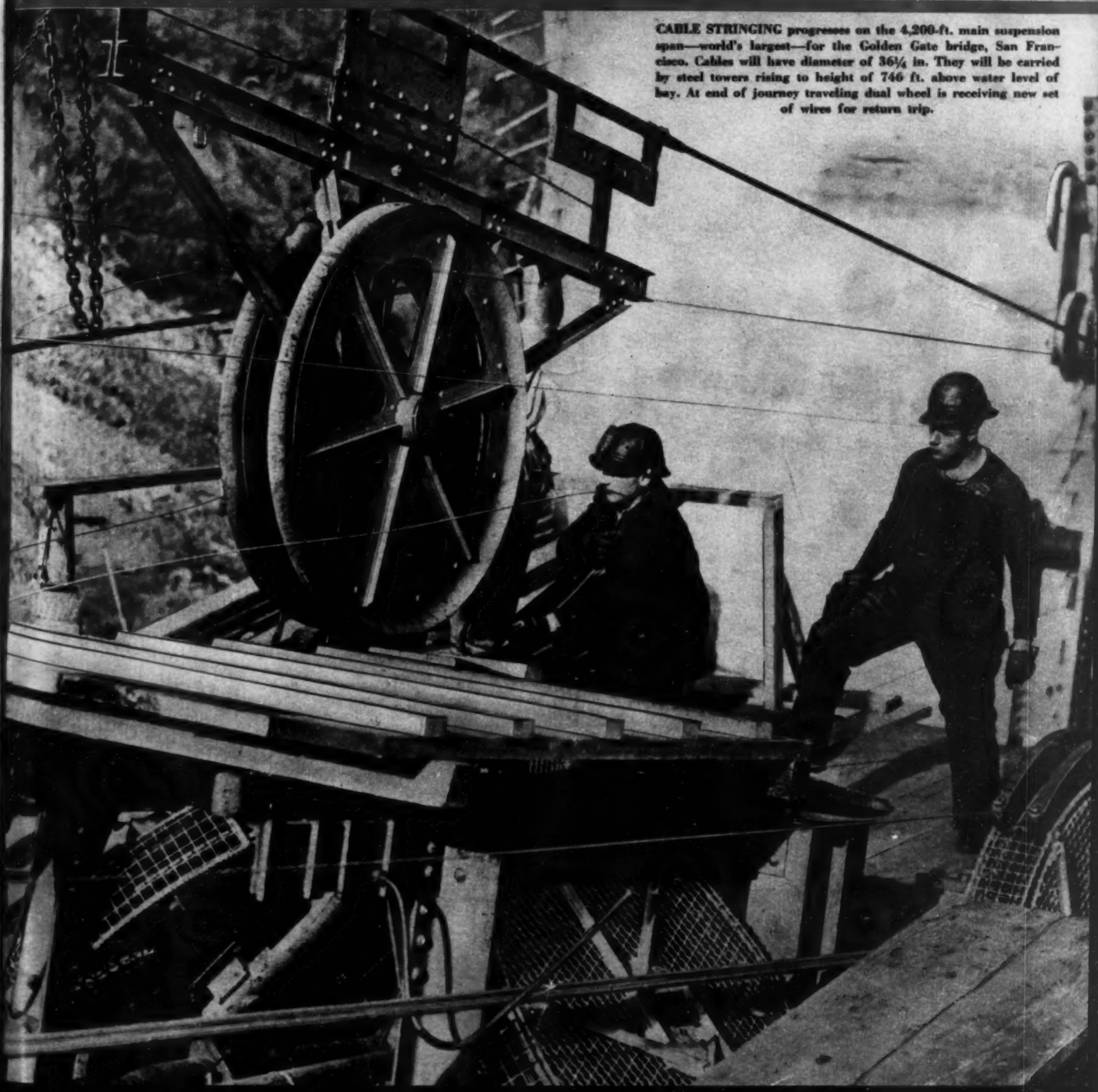
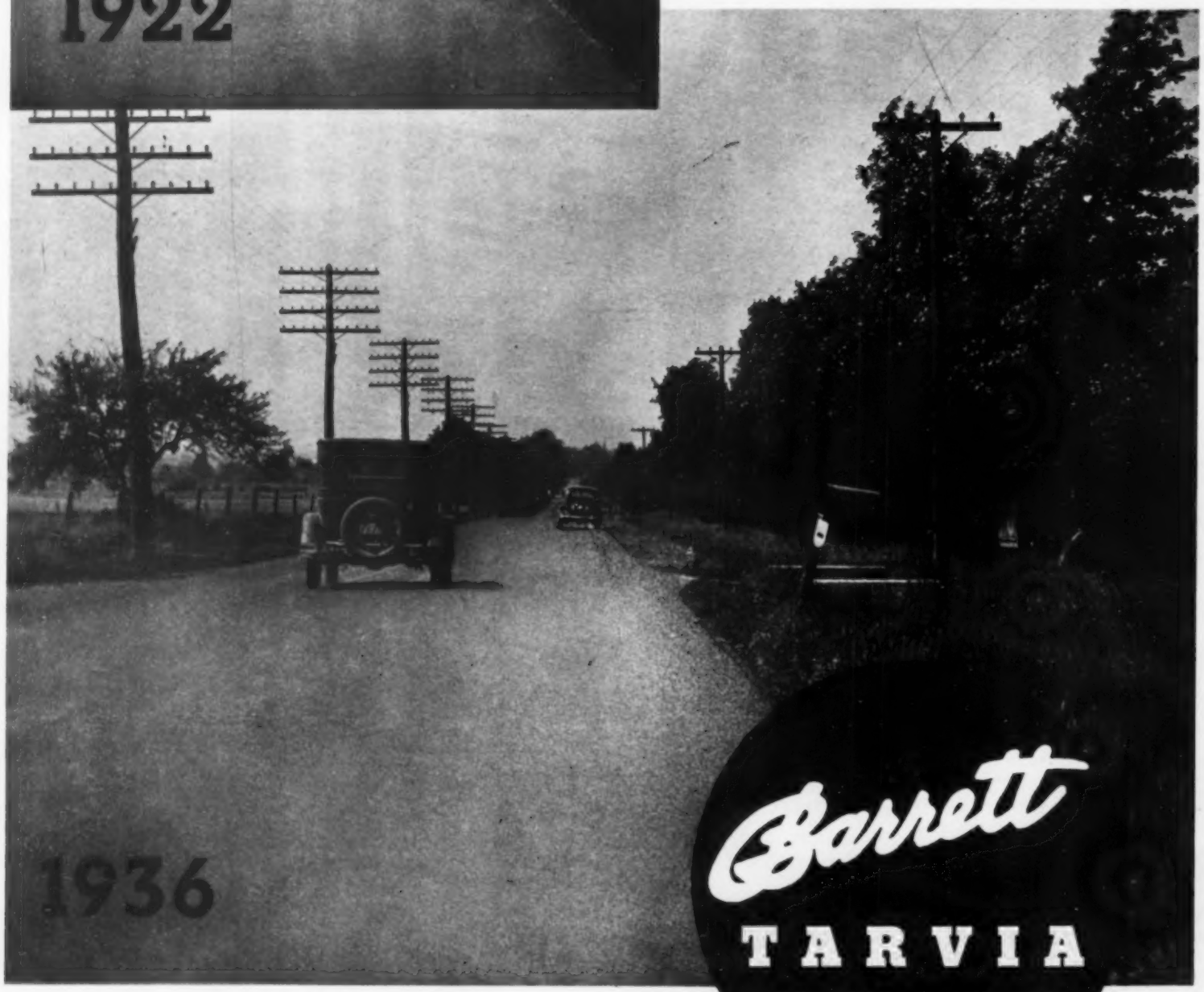


CABLE STRINGING progresses on the 4,200-ft. main suspension span—world's largest—for the Golden Gate bridge, San Francisco. Cables will have diameter of 36¼ in. They will be carried by steel towers rising to height of 746 ft. above water level of bay. At end of journey traveling dual wheel is receiving new set of wires for return trip.

IT is as wasteful to build roads that are too good as it is to build roads not good enough. Too much expensive construction results in too little pavement, and a neglected obligation to taxpayers and motorists. Tarvia roads can be matched to the traffic they must bear. Initial cost is low, and the roads may easily be widened and strengthened as traffic increases—without discarding the original investment and without interrupting traffic.

THE TECHNICAL SERVICE BUREAU of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector St., New York.



Kennedy Road, near Unionville, York County, Ontario, Canada. Tarvia-built, 1922, and as completely satisfactory today, for 1936 automobiles, as it was the year it was built.

THE BARRETT COMPANY New York Chicago Philadelphia Birmingham Boston St. Louis Cleveland Minneapolis Lebanon Milwaukee Detroit Baltimore Columbus Youngstown Toledo Buffalo Providence Syracuse Hartford Cincinnati Bethlehem Rochester Portland, Me. Norwood, N. Y. In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver

TECHNOLOGY DEPT.

Construction Methods

McGraw-Hill Publishing Company, Inc.
330 West 42nd St., New York

ROBERT K. TOMLIN, Editor — MARCH, 1936 — WILLARD CHEVALIER, Vice-President

Editorial Staff: Vincent B. Smith, John B. Huttl (San Francisco)
Leonard H. Church (Cleveland), Nelle Fitzgerald

Current Jobs

Waterworks

In the field of waterworks construction the following are among the larger contracts recently let: Crystal Springs pipe line, 10½ mi. long, for Public Utilities Commission of San Francisco, to **Youdall Construction Co.**, San Francisco, at price of $1,315,341. Chemical building and coagulation basins, Cincinnati, Ohio, to **Penker Construction Co.**, Cincinnati, for $942,517. Iron Mountain pumping plant for Colorado River aqueduct in California to **Wood & Bevanda**, Stockton, Calif., for $719,355.

Sewers

Detroit, Mich., awarded to **Blanck & Gargaro**, local contractors, a $635,131 contract for 4,500 ft. of intercepting sewer. At Niagara Falls, N. Y., **F. Caruso & Son**, of Philadelphia, were low bidders on city's sewage disposal plant and sewerage system, including tunnels, to cost about $2,000,000. The Chicago Sanitary District placed with **S. A. Healy Co.**, Chicago, a $1,578,600 contract for the Southwest intercepting sewer. Other sewer awards by the Chicago Sanitary District were to **McKay Engineering & Construction Co.**, Chicago, for 13,350 lin. ft. of the Des Plaines concrete interceptor, at $583,250; to **S. A. Healy Co.**, Chicago, for 27,750 lin. ft., at $1,087,525; and to **Underground Construction Co.**, Chicago, for 10,850 lin. ft., at $410,000. New York City's Department of Sanitation has made awards as follows: To **Rodgers & Haggerty, Inc.**, New York, $1,451,620 for Bronx intercepting sewer; to **Underpinning & Foundation Co.**, New York, $1,219,703 for superstructure at Ward's Island sewage works.

Bridges

Bridge and grade crossing elimination structures placed under contract include: Seven-span, 5,000-ft. steel state highway structure across Kansas River at Topeka, Kan., to **Missouri Valley Bridge & Iron Works**, Leavenworth, Kan., for $660,000; grade crossing elimination at Louisville, Ky., to **Henry Bickel Co.**, Louisville, for $1,190,556; paving and completing anchorages for Triborough bridge East River crossing, New York City, to **A. A. Volk Co.**, New York, for $749,513; overhead railroad crossing for California Division of Highways at Los Angeles to **Clinton Construction Co.**, Los Angeles, for $578,420. Among grade separation structure contracts awarded by the Michigan Highway Department are: $546,860 to **W. E. Lennane**, Detroit.

Highways

In Louisiana, **Barber Bros. Contracting Co.**, of Baton Rouge, was awarded a 9-mi. concrete paving job at $241,909. **Warren Bros. Roads Co.**, Cambridge, Mass., received a $290,755 state highway contract for 5 mi. in Wayne County, New York and in Wisconsin **J. R. Griffin Co.**, of Racine, was successful bidder on a 7.6-mi. project costing $235,700. Among lettings in Arizona were 8.8 mi. in Maricopa County to **Heuser & Garnett**, of Glendale, Calif., for $202,300, and in Montana to **Barnard Curtiss Co.**, of Minneapolis, a $210,152 highway project. Alabama placed a $209,768 award with **H. E. Wolfe**, of St. Augustine, Fla., for 7.8 mi. of concrete paving. **Baldwin Bros. Paving Co.**, of Cleveland, Ohio, bid in a 5.38-mi. concrete paving job for the state highway department at Springfield, Pa. For 12 mi. of rock asphalt construction in Nueces County, Texas, **Heldenfels Bros.**, of Rockport, Texas, were low bidders with $284,228.

AND WHO'S DOING THEM

How— . . . IN THIS ISSUE ARTICLES AND ILLUSTRATIONS TELL:

How . . . SECTIONAL PANELS of redwood plank and steel channels formed suspension bridge catwalk. — p. 27

How . . . PIPE DRAIN and non-clogging well pump lowered ground-water level for constructing concrete sewage tanks. — p. 31

How . . . CEMENT DISCHARGE from batch-trucks was controlled by screw-operated bottom gates. — p. 32

How . . . IMPROVED ANCHORAGE held heavy wood forms and allowed adjustment for concrete tank walls. — p. 32

How . . . STEAM AND TARPAULINS made possible cold weather concreting on large tanks. — p. 33

How . . . RIBBED WALLS for concrete house were built with flexible system of steel panel forms. — p. 35

How . . . SPACER BOLTS and adjustable threaded cones provided proper wall thickness for steel form assembly, — p. 35

How . . . FORM STRIPPING on concrete house was helped by special tool involving bolt and sliding weight. — p. 35

How . . . WINTER CONCRETING of small bridges was aided by demountable housing of sectional canvas panels. — p. 37

How . . . PORTABLE TRANSFER PLANTS, with truck-mixers, handled material for pavement widening strip. — p. 37

How . . . HIGH SPOTS at concrete pavement joints were cut down by portable gasoline-driven grinder. — p. 38

How . . . CRACKS in concrete pavement were filled with help of mobile maintenance equipment. — p. 38

How . . . WHITE CEMENT MARKERS, both precast and monolithic, were placed in pavement to guide traffic. — p. 38

How . . . REMODELING of department store was handled without interrupting normal business. — p. 40

How . . . TUBULAR STEEL FRAMING eliminated fire hazard during building reconstruction. — p. 40

How . . . BRICK HANDLING in stacks was simplified by special truck and trailer equipment. — p. 42

How . . . BELT CONVEYOR fed by truck-mixers delivered concrete into hopper above steel forms for aqueduct. — p. 43

How . . . PILE EXTRACTION was aided by steam-driven rig in conjunction with 16-part lifting tackle. — p. 43

How . . . WIDENING of highway underpass was done with precast concrete slabs. — p. 52

Irrigation and Drainage

Another large dam has been placed under contract by the U. S. Bureau of Reclamation. It is the Alamogordo dam, an earth and rock fill on the Carlsbad project at Fort Sumner, N.M., 1,550 ft. long and 135 ft. high. The successful bidder was **Hallett Construction Co.**, of Crosby, Minn., with a tender of $1,132,547. In Utah, the Reclamation Bureau awarded to **J. W. Terteling & Son**, of Boise, Idaho, a $424,978 contract for the Ogden-Brigham and the South Highland canals.

Public Buildings

Recent awards in the public building field include a 4-story office building in Olympia, Wash., to **Sheble Construction Co.**, of Seattle, for $560,870; a 32-story steel and concrete city hall in Kansas City, Mo., to **Swenson Construction Co.**, for $1,497,989; public school No. 239 in Brooklyn, N. Y., to **G. F. Driscoll Co.**, Brooklyn, for $1,077,782. A New York municipal hospital contract went to **C. T. Wills, Inc.**, of New York for $1,697,000. In Washington, D. C., the **George A. Fuller Co.**, of Washington, was successful in obtaining the $3,484,000 Federal Reserve Bank building job. Baltimore, Md., placed a $1,342,000 contract for its new 3-story Eastern High School with **M. A. Long Co.**, of Baltimore. Another high school project, in Philadelphia, Pa., went to the **McNichol Paving & Construction Co.**, of Philadelphia, for $1,197,000. Contracts totaling $2,375,102 were let by the Navy Department to the **Virginia Engineering Co.**, of Newport News, Va., for paving, quarters, warehouses and hangars at the Naval Air Station at Pensacola, Fla. Nashville, Tenn., is starting construction on a new court house under a $1,775,000 contract with the **J. A. Jones Construction Co.**, of Charlotte, N. C.

Current Jobs

Industrial Buildings

At Portland, Ore., **Guy Atkinson Construction Co.**, of Portland, has started work on a $750,000 nine-story addition to the mail order house of Montgomery Ward Co. For a factory at Edge Moore, Del., **Barclay White Co.**, of Philadelphia, is to receive $1,500,000 from the Ludlow Sales Corp., of Boston. To **J. A. Utley**, of Detroit, has been given a general contract for a new stamping plant for Fisher Body Corp. at Grand Rapids, Mich., estimated to cost $7,000,000. Another General Motors project, an assembly plant covering 43 acres at Southgate, Calif., to cost $2,500,000, has been awarded to **J. A. Utley**, of Detroit.

Miscellaneous

N. Y. Subway—New York City reenters the field of subway construction this month. Work will start on the first link of the Sixth Ave. route, between 40th and 47th Sts., for which the **Rosoff-Brader Construction Corp.**, of New York, holds a $5,583,768 contract from the Board of Transportation. Contracts for five additional sections of the Sixth Ave. subway, between 8th and 53rd Sts. will be let early this summer.

Transmission Line — Fritz Ziebarth, contractor, of Long Beach, Calif., has started work on the 237-mi. 230,000-v. transmission line, which will deliver power from Boulder dam to California. Work is under the direction of **F. E. Weymouth**, general manager of the Metropolitan Water District of Southern California, for which James M. Gaylord is chief electrical engineer.

Merritt Super-Highway — Connecticut is resuming construction of its 38-mile Merritt super-highway. In January a grading contract for $279,274 was let to **Daniel Deering Co.**, of Norwalk, Conn., and two small bridge contracts for $89,000 to **Paul Bacco**, of Stamford. Work on the project was begun in 1934 and 8¾ mi. of grading and four major bridges have been completed.

Boulder Dam Accepted — March 1 marked the formal acceptance by the U. S. Bureau of Reclamation of Boulder dam and power house, terminating the contract with **Six Companies Inc.**, and marking the end of actual construction begun nearly five years ago and completed more than 2 years ahead of schedule. Under its contract **Six Companies Inc.** will receive approximately $54,700,000. Concrete poured in Boulder dam totaled 3,240,871 cu. yd.

AND WHO'S DOING THEM

What Every Advertiser Knows

WHEN Owen D. Young recently made his plea for more temperate radio oratory, he was but recognizing sound advertising principles. Mr. Young points out that freedom of speech for a man whose voice can be heard by a limited audience involves values quite different from those that attach to a voice that may be heard around the world. He emphasizes that the very use of so powerful an instrument implies a proportionately increased responsibility to others: "When master voices in the field of politics," he reminds us, "are sounded throughout the nation, when they knock at the door of every home, what a responsibility there is attached to them! Upon their individual freedom to speak there is superimposed, in a very real sense, a kind of trusteeship for the nation."

This special responsibility of the man behind the microphone must be evident. But what the radio now has become for the spoken word, the printing press long has been for the written word; and every consideration laid down by Mr. Young to govern the new projector of speech should govern the use of the public press. Every competent and responsible journalist knows this and tries to practice it; every constructive advertiser knows it and seeks to keep from his advertising copy the "extravagance of statement, carelessness and emotional appeal; the gibe, the exaggeration and the exuberance" which, Mr. Young declares, may well become "an agency of irremediable injury when uttered by a voice of great authority before a master sounding board while millions listen."

WHAT a salesman may say to a prospect in a personal interview or what a business man may write to his customer in a letter is an affair of limited scope and influence. But when a business man enters the public forum provided by a general magazine or by an industrial journal of substantial readership and influence, it is something quite different.

Here, as with the radio speaker, his audience is multiplied incalculably; here the opportunity for cross-questions, corrections and explanations is absent; here the reckless word, the exaggerated phrase, the unfair reflection or the subtle insinuation is enormously magnified in its ultimate effects, not alone upon its object but also upon the industry of which he may be a part.

The trusteeship for the public interest so well portrayed by Mr. Young as inherent in the use of the radio is no greater than the trusteeship for the welfare of an industry that is imposed upon any member of that industry who addresses his market through advertising. Some years ago, during one of those occasional but happily rare controversies that reach the advertising pages of an industrial journal, the publisher received several protests, not from the concern against whom the attack obviously was directed, but rather from other members of the industry who felt that such public warfare was a detriment to each of them, even though they were not involved in the specific controversy.

NO man ever tore down a competitor by an advertising attack without tearing down in some measure the industry of which both he and his competitor were a part. No man ever shook the faith of a market in products bearing one brand without in some measure impairing that faith in all kindred products of whatever brand. To use the power of advertising for an attack on a competitor may, under provocation, bring a sort of emotional satisfaction; but in the long run it is a costly satisfaction. It has been said that nobody really wins a war; it is equally true that nobody really wins an advertising controversy.

The temperance of speech enjoined by Mr. Young on the political orators is but a plea for constructive rather than destructive public education. His policy is comparable with the policy of creative rather than competitive advertising as practiced today by progressive industralists. His plea for light rather than heat, for reason rather than emotion and for substance rather than exuberance is in line with what advertisers have learned concerning the true interests of their prospective customers. Every advertiser knows that his prospects are interested in themselves, their own problems and what the advertiser offers to help them; not in differences between advertisers, however important these may seem to the latter. He knows that concentration on his prospects' interests will be more profitable to him than the cleverest "wisecrack" he ever could coin at the expense of a competitor. Great industries are created by building, not by tearing down; by constructive enterprise, not by destructive controversy.

What Mr. Young asks, therefore, is that every politician should learn what every advertiser knows.

Willard Chevalier

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WILLARD CHEVALIER Vice-President
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Capacity
an Important Factor
in ESTABLISHING
Lower Yardage Costs

TRAC-TRUKS

HAUL BIGGER LOADS AT

"Greater Speed measured in

ROUND-TRIP TIME"

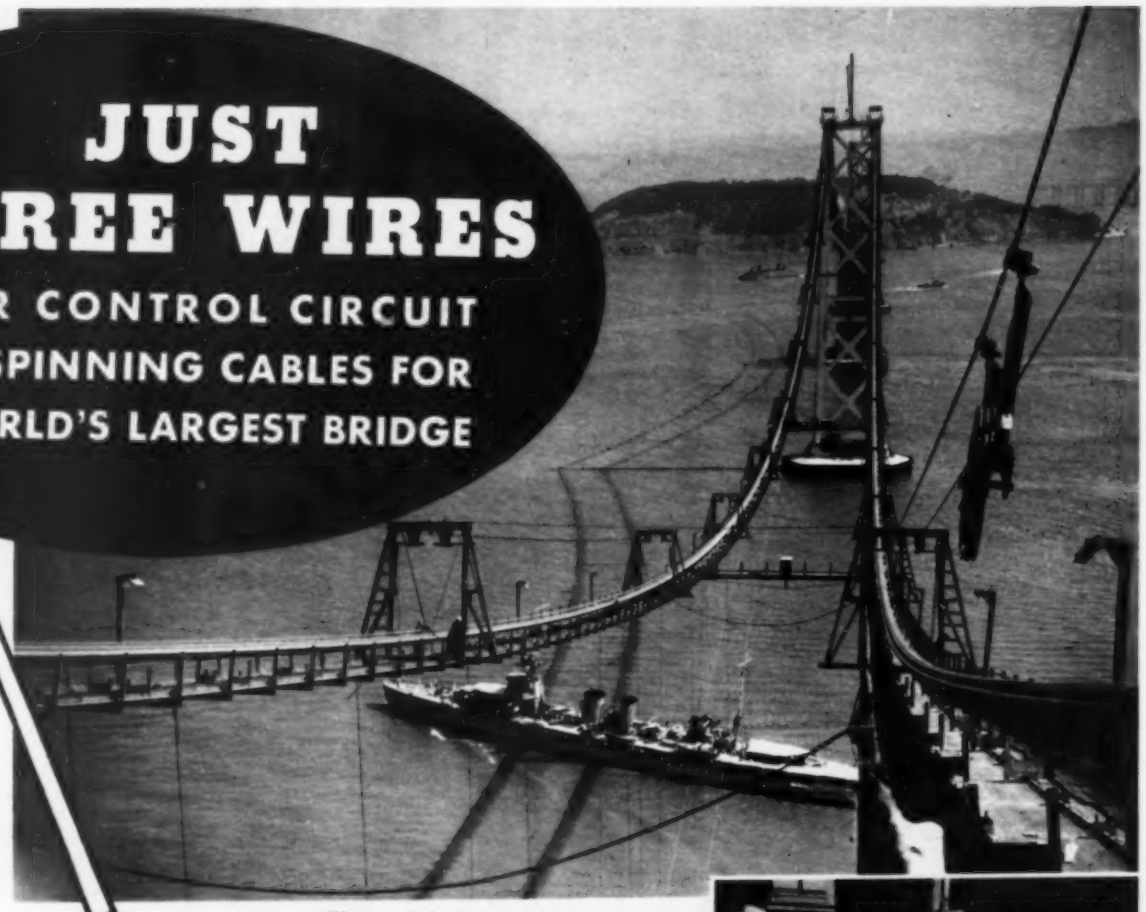
The thoughtful contractor gives careful consideration to many requirements in selecting hauling equipment. *Capacity* is of first consideration. Trac-Trucks have the capacity to haul 9 full yards. Their *noted round trip time* is all the more favorable because of the *bigger loads* that these units carry. Capacity and speed in round trip time are determining factors in effecting *lower yardage costs* for which Trac-Truks are unequalled.

THE EUCLID ROAD MACHINERY CO.
CLEVELAND, OHIO U. S. A.

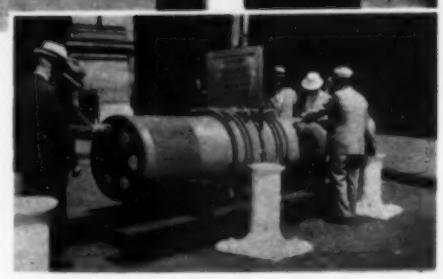
EUCLID
THE PIONEER

JUST THREE WIRES

FOR CONTROL CIRCUIT IN SPINNING CABLES FOR WORLD'S LARGEST BRIDGE



Photograph by Courtesy of Gabriel Moulin



How finished cable will look, compacted to 28¾ in. diameter. Structural cable, and entire superstructure, being supplied and erected by U. S. Steel Corporation Subsidiaries.

HIGH ABOVE San Francisco Bay, modern construction methods and expert engineering are teamed in spinning two-mile-long cables to support the double-decked, six-lane roadways for the San Francisco Bay Bridge.

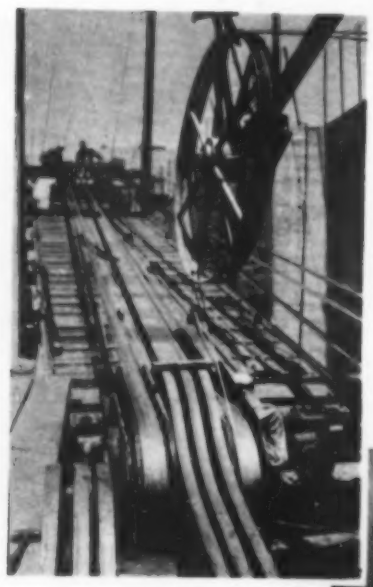
For this immense project, the construction engineers planned to draw four wires per spinning wheel instead of the usual two. To fulfill the extraordinary motor and control requirements, G-E engineers devised a unique control system using but three wires to the circuit for all control operations. When finished, each cable will contain 17,464 wires and will weigh one ton per foot.

The electric circuit and the G-E motors and control give ample provision for:

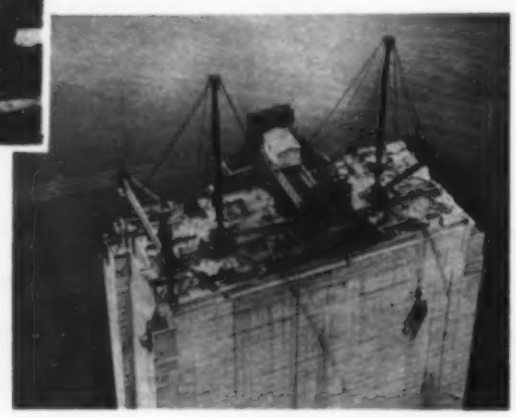
Keeping in step the haulage motors at both ends of the mile-long haulage loop which draws the spinning wheels.

Accelerating the spinning wheels smoothly enough to permit the heavy reels of wire to be accelerated at the same rate as the spinning wheels. Automatically or manually stopping the equipment should a cable wire break at any point, or slip out of the groove of the spinning wheel.

For assistance in applying fast and economical electric equipment — for either standard or special duty — refer to the nearest G-E office, or write General Electric, Dept. 6-201, Schenectady, N. Y.



Spinning wheel, carrying cable wires, leaving San Francisco anchorage



The white shack, in the middle of the center anchorage, houses electric equipment for cable-spinning operation

080-64A

GENERAL ELECTRIC

COSTS TAKE A 'NOSE-DIVE'

"NINETEEN days from the time we started to lay this building out, we had poured the last of 1500 cu. yds. of concrete," says George Caldwell, Superintendent of Construction at Louisiana State University—referring to Highland Hall, dormitory for women, one of a number of structures on the L. S. U. campus (air view above) built with 'Incor'. Continuing, Mr. Caldwell states:

"For this 4-story building, we had to buy form lumber for only 2 floors. We poured a floor every other day, re-using first and second floor forms for third floor and roof slab. That saved 35,000′ of form lumber, at about 12¢ a ft. With ordinary Portland cement, the job could not have been completed on time. By using 'Incor' we saved 30 days—and $4200."

Because 'Incor' is self-supporting in one-fifth the usual time, forms are stripped in 24 to 48 hours—ready for re-use. One form-set does the work of two or three—saving 50% to 70% on form costs.

Speed of erection no longer depends upon form multiplicity. Instead, it is based upon the contractor's ability to organize labor and equipment. Figure 'Incor'* against ordinary Portland cement on your next job and see the difference. Made and sold by producers of Lone Star Cement, subsidiaries of International Cement Corporation, New York; also sold by other leading cement manufacturers. *Reg. U. S. Pat. Off.

'INCOR' 24-Hour Cement

Firestone
GROUND GRIP TIRES
—Greatest Traction FOR ALL CONSTRUCTION JOBS!

Firestone Ground Grip Tires haul heavy loads through the toughest going! These massive tires, with the patented super-traction tread, pull right through sand, mud, loose gravel, snow—without chains. They speed up work—cut operating cost.

To gain tremendous strength to withstand such heavy construction work these tires are built with patented Gum-Dipped High Stretch Cords—and two extra layers of these cords lock the tread permanently to the body of the tire.

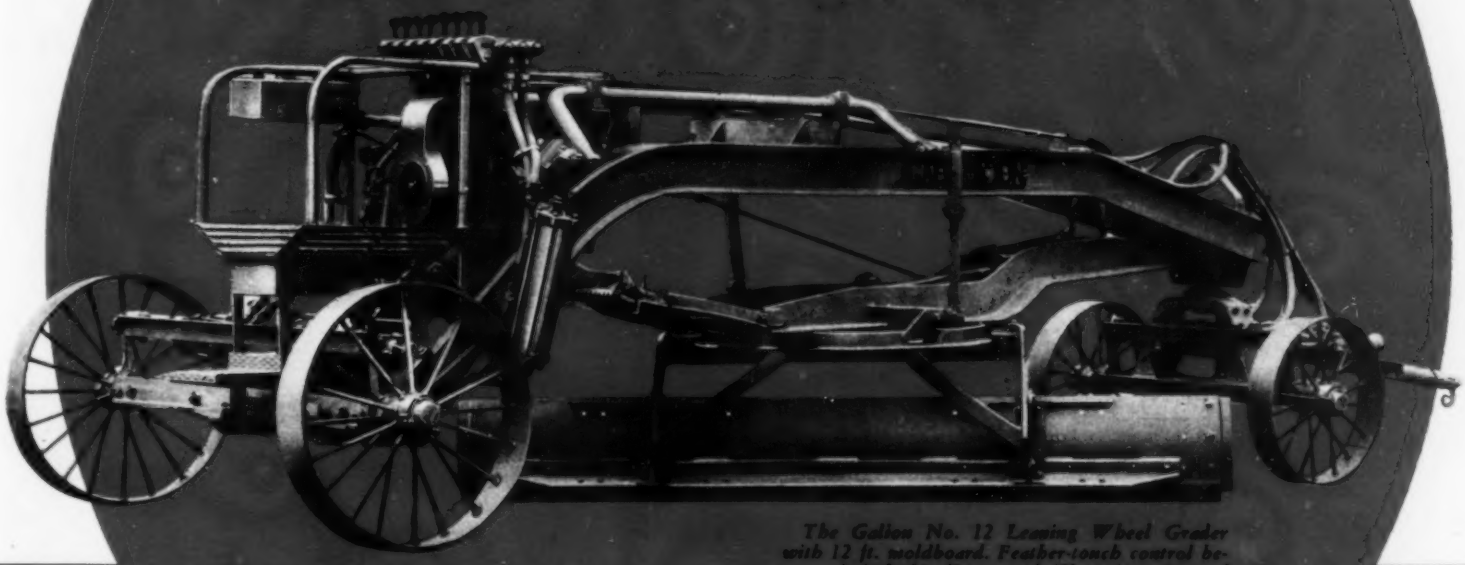
Save time, money, trouble—equip with Firestone Gum-Dipped Tires. The nearby Firestone Auto Supply and Service Store or Firestone Tire Dealer is ready to serve you.

Listen to the Voice of Firestone featuring Richard Crooks or Nelson Eddy—with Margaret Speaks, Monday evenings over Nationwide N. B. C.—WEAF Network

© 1936, F. T. & R. Co.

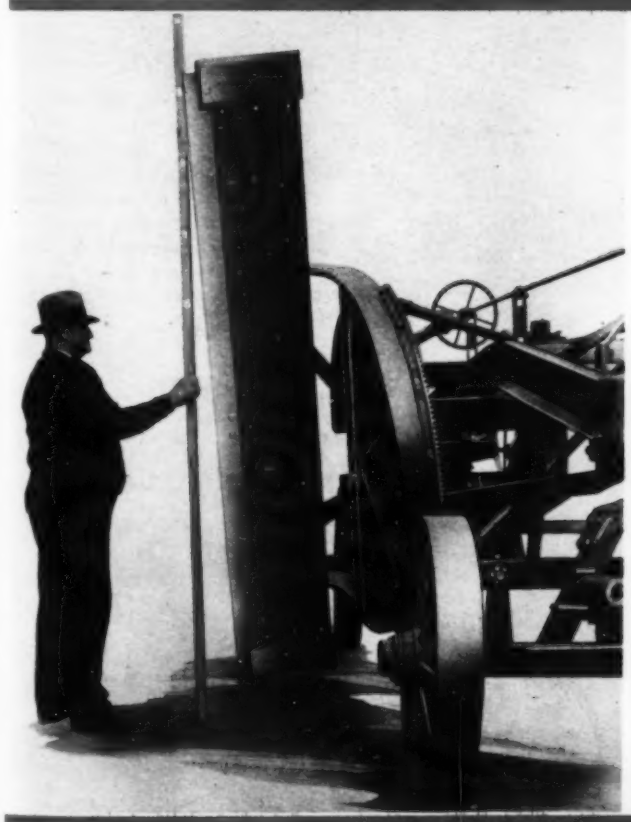
The GALION No. 12

COSTS LESS TO OPERATE
COSTS LESS TO MAINTAIN



The Galion No. 12 Leaning Wheel Grader with 12 ft. moldboard. Feather-touch control because it is hydraulic control. There is a size and type Pull-type Grader in the Galion line to meet any requirement you may have.

Quick adjustment of the moldboard (below) to any angle for bank cutting provides more actual grading time. Moldboard is adjustable far out of line of grader frame for trimming shoulders.



● The Galion Hydraulically Controlled Leaning Wheel Grader is economical to own. A slight forward or backward movement of the eight short range levers makes every necessary adjustment *instantly*. Hydraulic power requires less machinery . . less time of the operator to attend to lubrication, adjustment, etc.

Operation is free of clutches . . free of gears . . free of universal joints . . free of telescopic shafts and other wearing parts. Lost motion is eliminated. Control is positive at all times. Weather or temperature conditions do not interfere with productive operation.

A light, smooth cut or a tough, deep cut can be made instantly. No jockeying "for depth". . the Galion No. 12 Grader takes it off . . smoothly and economically.

Send for Bulletin No. 182, which describes this Grader as well as the No. 112 with Manual control.

THE GALION IRON WORKS & MFG. CO.

GALION OHIO U. S. A.

BALANCE

is everything here!

These products will help you keep the right balance between estimates and cost

FOR balancing actual *costs* against original *estimates*... for keeping machines on balanced schedules . . . lubrication may be a vital factor.

You can trust Texaco Lubricants to give your machinery real protection against lay-ups.

For your Diesels, Texaco Alcaid, Algol and Ursa Oils are refined especially for this service. Newly developed Texaco processes give them unusual purity and toughness — hence a greater capacity to withstand pressures and temperatures.

What little carbon is formed by *these* oils is soft and fluffy. It readily blows away.

Many oils leave gums and hard carbon which clog piston rings, cause undue wear and shut-downs for cleaning. Such oils are expensive at any price.

These great Diesel-electric drag lines on one of the toughest construction jobs in the West are lubricated exclusively with Texaco Ursa. The contractors have proved the outstanding superiority of Texaco performance. Texaco Lubricants are used on all their jobs wherever they may be.

Your Diesels will operate most efficiently with Texaco Ursa or other Texaco Diesel Lubricants. These products reduce wear and power losses, lower maintenance costs, and cut down unnecessary idle time. They will help you protect your profit-margin.

Write to The Texas Company and we will send our representative to serve you.

THE TEXAS COMPANY
135 East 42nd St., New York City
Nation-wide distribution facilities assure prompt delivery

TEXACO *Industrial Lubricants*

at the BONNY BLUE MINE *of the* Blue Diamond Coal Co.

Cutting, blasting, loading, and rehandling are all accomplished with maximum efficiency at the Bonny Blue (Virginia) mine of the Blue Diamond Coal Company. Two examples of this are shown in these photographs, taken at the property on February 10th, 1936.

One is a unique conveyor system, 4,000 feet long, that delivers the coal at the railroad.

The other is Ensign-Bickford Safety Fuse —uniformly dependable—and always available in a number of standardized brands, each made for a particular set of conditions. Write for the Safety Fuse book.

Beginning a 1836 1936 NEW CENTURY

SF-51

The ENSIGN-BICKFORD COMPANY Simsbury, Conn.

SAFETY FUSE *Since 1836* • CORDEAU-BICKFORD DETONATING FUSE

Roebling...

The pacemaker in wire rope development

THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.

John A. Roebling's Sons Co., Trenton New Jersey

JAEGER BITUMINOUS PAVER

1- SMOOTHER SURFACES—carries own 18 ft. movable forms.

2- 50% MORE TRACTION—semi-crawler wheels, 4 wheel drive, all on hard ground.

3- NO TRACTION, NO WEIGHT ON NEW LAID MATERIALS—no tearing or rutting surface, no creeping of new material.

4- ADJUSTABLE—9 to 14 ft. widths.

5- BLENDS PERFECT JOINTS—Fills Flush to Curb.

6- CAPACITY TO 1000 TONS A DAY—due to 25 ft. per minute finishing speed, wider widths.

7- LAYS HOT OR COLD BITUMINOUS, STONE OR MACADAM.

8- GREATER UNIFORM DENSITY—due to pug mill spreader, better screed action.

9- CUTS COSTS—less hand finishing, bigger capacity, one man control.

10- TAKES PUNISHMENT—finest automotive construction throout.

These and All Other Details Fully Described in 56-page Catalog Write Us!

10 ADVANTAGES NOT FOUND IN ANY OTHER PAVER . . . .

10 REASONS WHY YOU MAKE MORE MONEY, DO BETTER JOB

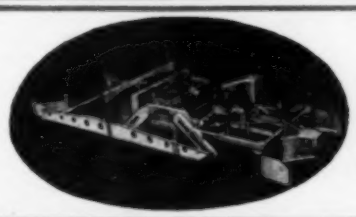
Yesterday's methods just can't compete with the Jaeger Bituminous Paver for speed, for smoothness of the surface, or for saving handwork back of the machine.

It can lay hot or cold bituminous faster than your plant can mix it, has power and push enough to climb a mountain, and at no time does it touch the new material with any part except the screed.

Tandem Pavers—1500 Tons a Day !

Check the 10 practical advantages found in no other paver. They'll show you why road-builders are pensioning off their older equipment and paying for Jaegers with the first new job.

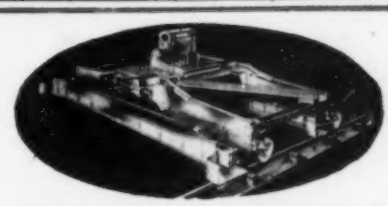
The JAEGER MACHINE CO.
800 DUBLIN AVE. COLUMBUS, OHIO



"TRIPLE PUG MILL" ROAD BUILDER
Lays Low Cost Roads in One Pass

SPREADER BOXES
CONCRETE SPREADERS
FORMS, SUBGRADERS
CONCRETE MIXERS
PUMPS

AUTOMATIC FINISHERS
for Highest Type Concrete and Bituminous



NORTHWEST

Dipper Sticks provide the largest factor of safety of any shovel on the market size for size . . . .

Northwest Dipper Sticks are not left to flap in the wind. They are tied together at the inner end with a heavy cap casting that assures their operating rigidly together as a unit. This assures 50% greater resistance to twisting strains than if the ends were free.

THE SIMPLEST MOST POWERFUL INDEPENDENT CROWD on the market TODAY!

NORTHWEST ENGINEERING COMPANY

The world's largest exclusive builders of gasoline, oil, diesel or electric powered shovels, cranes, draglines, pullshovels and skimmers

1728 Steger Building
28 East Jackson Boulevard
Chicago, Illinois, U. S. A.

SHOVELS, CRANES
DRAGLINES
PULLSHOVELS
SKIMMERS

NORTHWEST

GASOLINE, OIL
DIESEL OR
ELECTRIC
POWERED

BUILT IN A RANGE OF 15 SIZES — 3/8 YD. CAPACITY AND LARGER

On price alone, or on specifications alone, or on the still sounder basis of its ability to outperform and out-earn this rugged GMC truck is an unequalled value.

Greater Power—Increased horsepower and increased torque for more work . . . in fact a larger engine than ever before in a GMC at this low price . . . efficient valve-in-head design, of course, and many refinements that assure ample power for every demand.

Improved Performance—Engine improvements, transmission improvements, rear axle improvements, refinements throughout the entire truck, assure the kind of performance that will fully satisfy the most exacting truck operators.

Streamlined Appearance—One glance at this GMC 3-ton value for 1936 and ten to one you'll say its advanced streamlined appearance—in the all-steel "helmet top" cab as well as in the chassis—sets it apart as a truly distinctive vehicle.

Driver Appeal—In addition to the many chassis refinements that contribute to the driver's physical and mental comfort there is likewise a roomy, comfortable cab with many conveniences such as advanced features of ventilation, that will improve the efficiency of any driver.

Dual Performance and other money-saving advantages—Throughout this exceptional truck are features that shrewd operators will be quick to value in a dollars-and-cents way. And available also is GMC dual performance rear axle which saves gas, lowers upkeep costs, saves oil, saves time and lessens wear.

1/2 TO 15 TONS

TIME PAYMENTS AVAILABLE THROUGH OUR OWN Y.M.A.C. 6% PLAN

General Motors Trucks and Trailers

General Motors Truck Company. Pontiac. Michigan

On the Leesville Dam in Ohio, this "Caterpillar" Diesel Tractor works with a bulldozer, helping to move 700,000 cubic yards of material.

FIRST FOR THE SCHEDULES! FIRST ON THE JOB!

When it comes to working out bids and schedules, you'll find that tractor costs are more and more being figured on the basis of what the "Caterpillar" Diesel Tractor can do—its low-cost operation and dependability make possible winning bids with an honest profit margin. When it comes to meeting the schedule and keeping the job moving smoothly, it's the "Caterpillar" Diesel again—hanging up records for low cost per hour, more working hours per day, more work per hour. It is FIRST on every count—get the details from your dealer. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

HERE ARE FACTS ON THE SHOW-DOWN

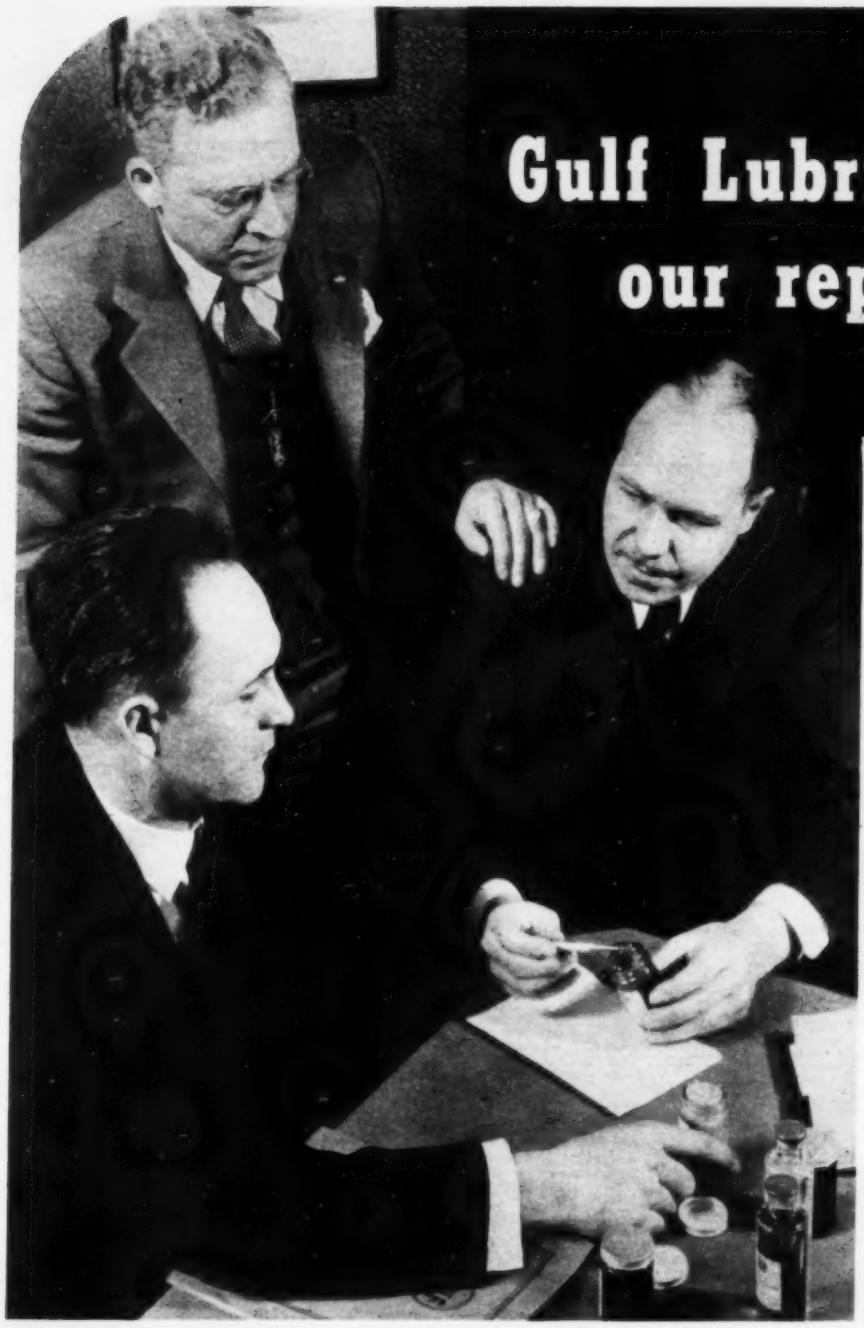
A Texas owner reports: "My 'Caterpillar' Diesel Tractor does the same work as my old gasoline tractor, but my fuel cost is now $1.20 per day, where it used to be about $7.70."

On the Mississippi Levee, a contractor reports that his "Caterpillar" Diesel has been hauling big loads from a drag-line at a fuel cost of only 15c per hour.

CATERPILLAR DIESEL

REG. U. S. PAT. OFF.

These Gulf Lubricants have cut our repairs IN HALF



● Gulf lubricants look like good lubricants. But, it is their service record—in reducing maintenance and lubrication costs—that proves the unparalleled quality of the 400 oils and greases in the Gulf line.

Scores of contractors testify to important savings from improved lubrication

● Here is the reason why leading contractors report substantial savings in repair and maintenance costs with Gulf lubricants in service:

The user of Gulf products receives the service of a trained lubrication engineer whose one purpose is to assist in making machinery operate more efficiently. From a broad line of quality oils and greases, the Gulf engineer recommends the type of lubricant which is most economical and efficient for each piece of equipment.

With friction reduced to a minimum through proper application of the right lubricants, moving parts operate with far less wear and there is less need for repairs and replacements. Frequently, savings in repair bills alone more than pay for the lubricants used.

If you are not using Gulf products, we suggest that you discuss with a Gulf engineer just what steps can be taken to increase the efficiency of your mechanical equipment. You will not be obligated in any way.

GULF INDUSTRIAL LUBRICATION

Have You Tried the New GULFLUBE *Motor Oil?*

It is the only premium quality motor oil refined by the Multi-Sol process and sold at "regular" price. Gulflube Motor Oil is a real "buy" for your fleet equipment.

Enjoy Gulf's new radio program featuring Phil Baker in "The Great American Tourist" over CBS Sunday evenings 7:30 E. S. T.

GULF REFINING COMPANY, PITTSBURGH, PA.

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MAKERS OF THAT GOOD GULF GASOLINE AND GULFLUBE MOTOR OIL

A 2 YD. SHOVEL
THAT'S GOT EVERYTHING!

HERE'S a machine—the new P&H 765—that embodies every new development in high-speed shovel construction.

IT is lighter, far less cumbersome. That means less deadweight to move, less inertia, and far higher production—strength for the hardest service.

IT employs all-welded high tensile steel—the new alloy, nearly twice as strong, is used wherever strength with lightness is important.

IT has a full live roller circle of large diameter for easy swinging, greater stability, and longer life.

IT is Diesel powered—as standard equipment, and it's built to stand up under the stress of Diesel torque.

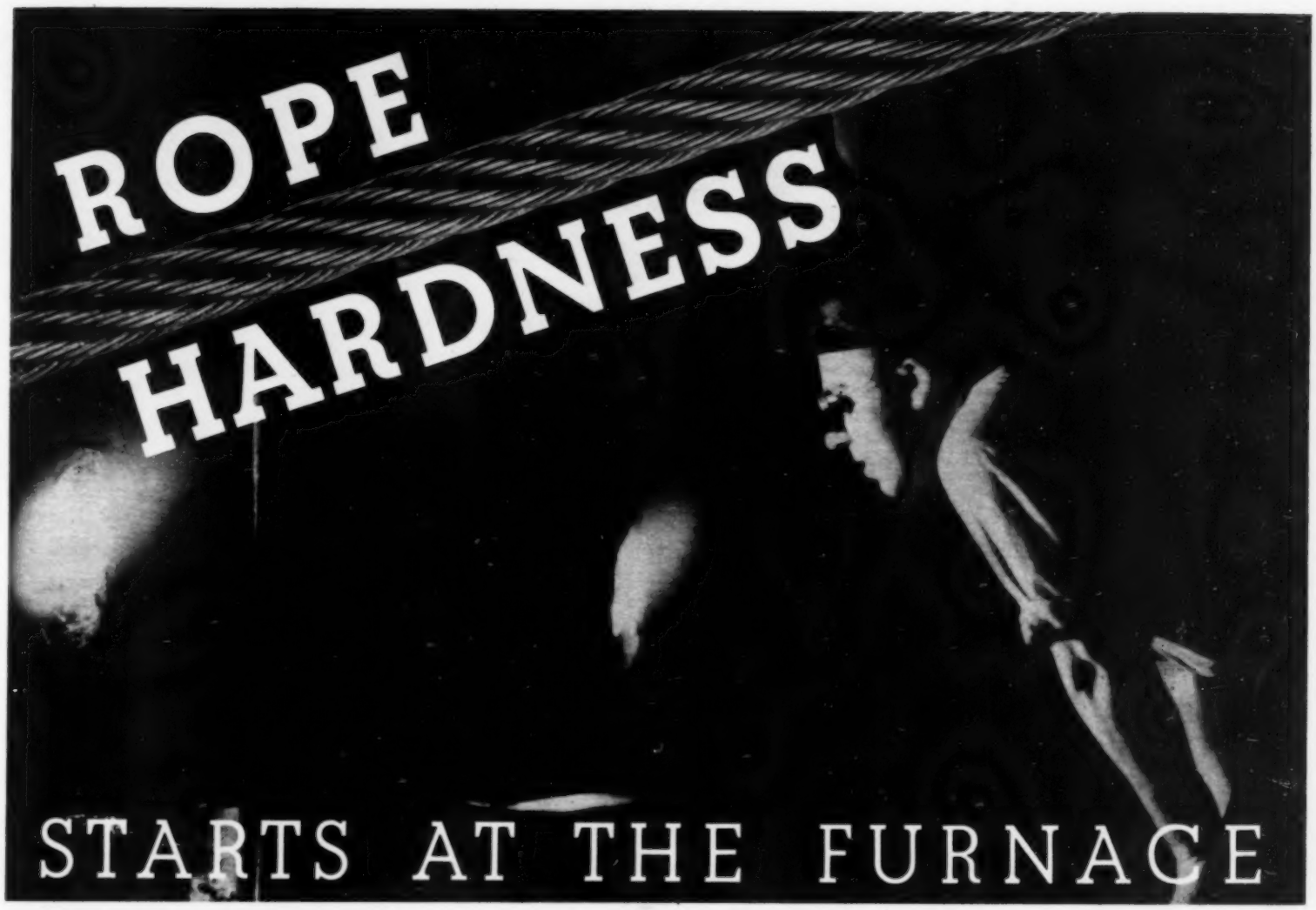
IT has P&H patented chain crowd—all the P&H Split Second Control features that mean fast cycles, low costs—minimum time out for repairs.

The 765 sets the pace for 2-yard excavators—in design and on the job. Send for full information.

HARNISCHFEGER CORPORATION
4494 W. NATIONAL AVENUE **Established 1884** **MILWAUKEE, WISCONSIN**

Warehouses and Service Stations: Hoboken—Memphis—Jacksonville—Seattle—Dallas—Los Angeles—San Francisco

P&H PACEMAKERS···*FASTER IN THE FIELD*



Select the Rope that Fits Your Job

The harder the steel the better the rope withstands abrasion. But with increasing degree of hardness a rope loses in flexibility. A rope should be fabricated from a steel with the exact hardness to effectively withstand both abrasion and bending, each in the degree present in each particular rope service. Because hardness can only be put into rope when the steel is made, Wickwire Spencer metallurgists always consider the use when deciding the carbon content of every heat. Data they have collected is available to aid you in selecting a rope of proper hardness for your particular service. Write for this information. Get longest possible life out of wire rope.

●

WICKWIRE SPENCER STEEL COMPANY, *General Offices:* 41 East 42nd Street, New York. *Sales Offices and Warehouses:* Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; *Export Sales Dept.:* New York. WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.

WIRE ROPE
by Wickwire Spencer

WICKWIRE SPENCER STEEL CO.
41 East 42nd St., New York City
Please send me reprints of previous advertisements which tell "How to make Wire Rope last longer".

Name_____

Firm_____

Address_____

City_____ State_____

"Build Safer Roads"

Installation of Armco Metal Cribwall in Idaho permits shift in road to avoid dangerous, sliding slopes. Note how wall is built to fit curve.

"BUILD safer roads" is America's cry today! Road widening and straightening—two important methods—frequently involve restricted right of way where some means must be found to stabilize the cut and fill slopes. And a retaining wall is the answer.

With an eye to the future, road officials are turning to retaining walls of Armco Metal Cribbing. The individual units are light in weight, but when bolted together, they form a strong, durable wall. Furthermore, should changing conditions require it, this type of wall can readily be extended, raised or removed and used elsewhere.

Ask to see the Construction Manual on Armco Metal Cribbing which the Armco man will be glad to discuss with you in terms of your retaining wall problems.

Armco Culvert Manufacturers Association
Middletown, Ohio

☐ Please send me your latest free catalog.

☐ I am interested in a retaining wall..... ft. long by..... ft. high.

Name .....

Title .....

City .....

State CM-3

ARMCO

Armco

METAL CRIBBING

For unstable slopes

KOEHRING

5/8 yd.

HIGH SPEED
ENCLOSED GEARS
ANTI-FRICTION BEARINGS

built the Koehring Way

WRITE FOR THE COMPLETE STORY OF THIS NEW KOEHRING

KOEHRING HEAVY DUTY

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

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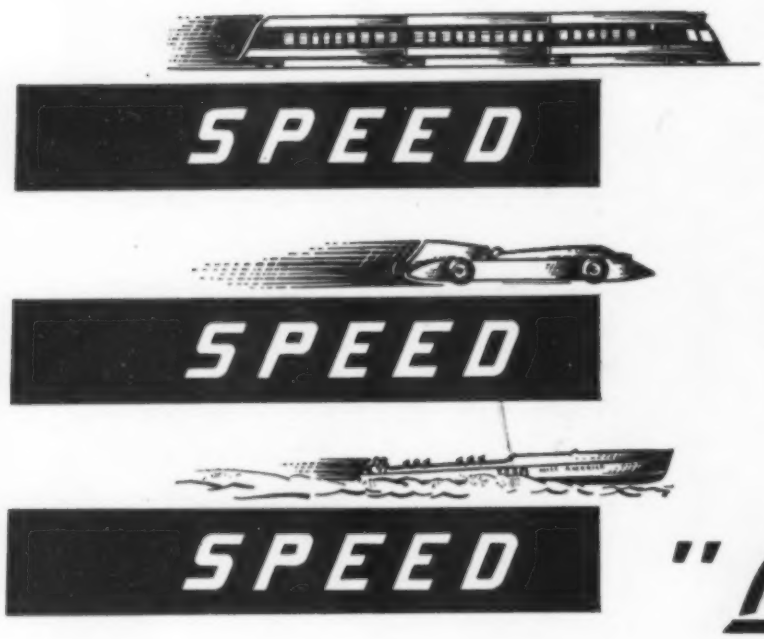

Have you seen the Latest "Built for Speed"

LINK-BELTS?

LINK-BELT SHOVELS–CRANES–DRAGLINES

ADVANCED ENGINEERING ... ABUNDANT POWER ... STRENGTH ... STABILITY LONG LIFE ... LOW UPKEEP

From 1 to 3 yds. capacity, heavy-duty built. Gas engine, Diesel or electric motor drive. All models can be shipped loaded on a flat car without dismantling.

LINK-BELT COMPANY
300 W. PERSHING ROAD - - CHICAGO

Offices and Distributors In All Principal Cities

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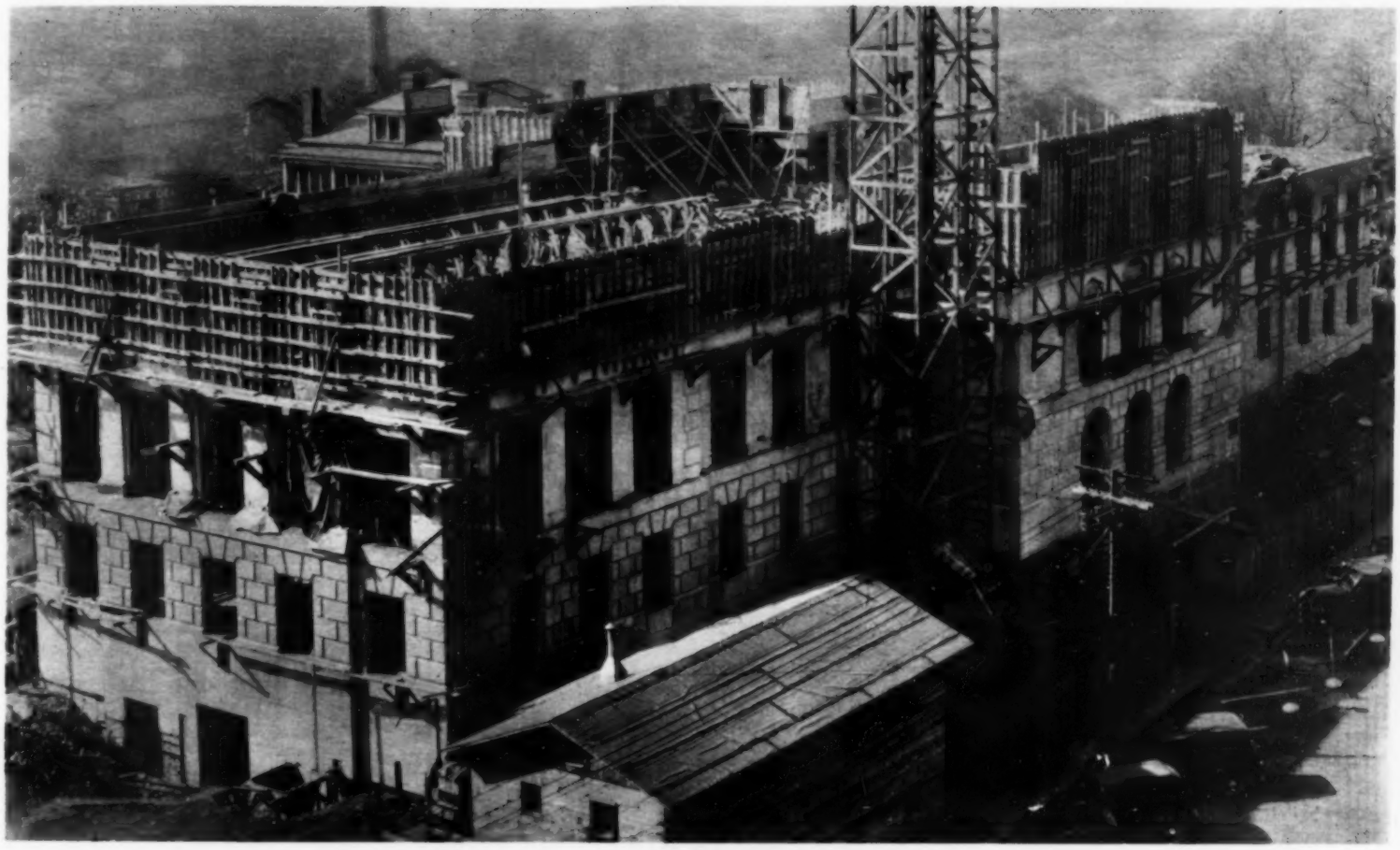


Construction view of Federal Court House at Columbia, S. C. Architect: Harold Tatum, Charleston; Contractor: James I. Barnes, Springfield, Ohio: A. W. Brown, Engineer in Charge for the Treasury Department.

Approved method of construction that means

MORE JOBS...AND MORE PROFITS...FOR YOU

ARCHITECTURAL CONCRETE

PREPARE now to capitalize the rapidly growing acceptance of Architectural Concrete as a method of building construction.

There is no doubt about this acceptance! Far more buildings — important schools, churches, post offices, and industrial and commercial and other buildings including houses — were built in Architectural Concrete during the past eighteen months than in any like period.

We are launching immediately a national advertising campaign in such widely read publications as "Fortune" and "Business Week," to acquaint business leaders — the buyers of buildings — with Architectural Concrete.

Because of its advantages of low cost, low maintenance, weather resistance, fire safety and beauty, Architectural Concrete will be considered for more and more of the building jobs coming up in your community. The general contractor whose organization is familiar with the Architectural Concrete technique will have the "edge."

Are you all set? We will furnish the practical information you need, including new handbook "Forms for Architectural Concrete," just off the press.

CRAFTSMANSHIP GAINS NEW IMPORTANCE

Architectural Concrete's endless variety of textures and effects places a new premium on the builder's skill and experience. Grain marks of form lumber may be frankly capitalized. Or the architect may specify smooth surfaces (plywood or Presdwood forms); rough textures with exposed aggregates; dash coat or troweled stucco. Pleasing color effects are obtainable with cement paints, colored aggregates, pigments or stains. Intricate detail may be molded monolithically at low cost using waste molds.

PORTLAND CEMENT ASSOCIATION
Dept. A3-16, 33 W. GRAND AVE., CHICAGO, ILL.

Please send literature checked.

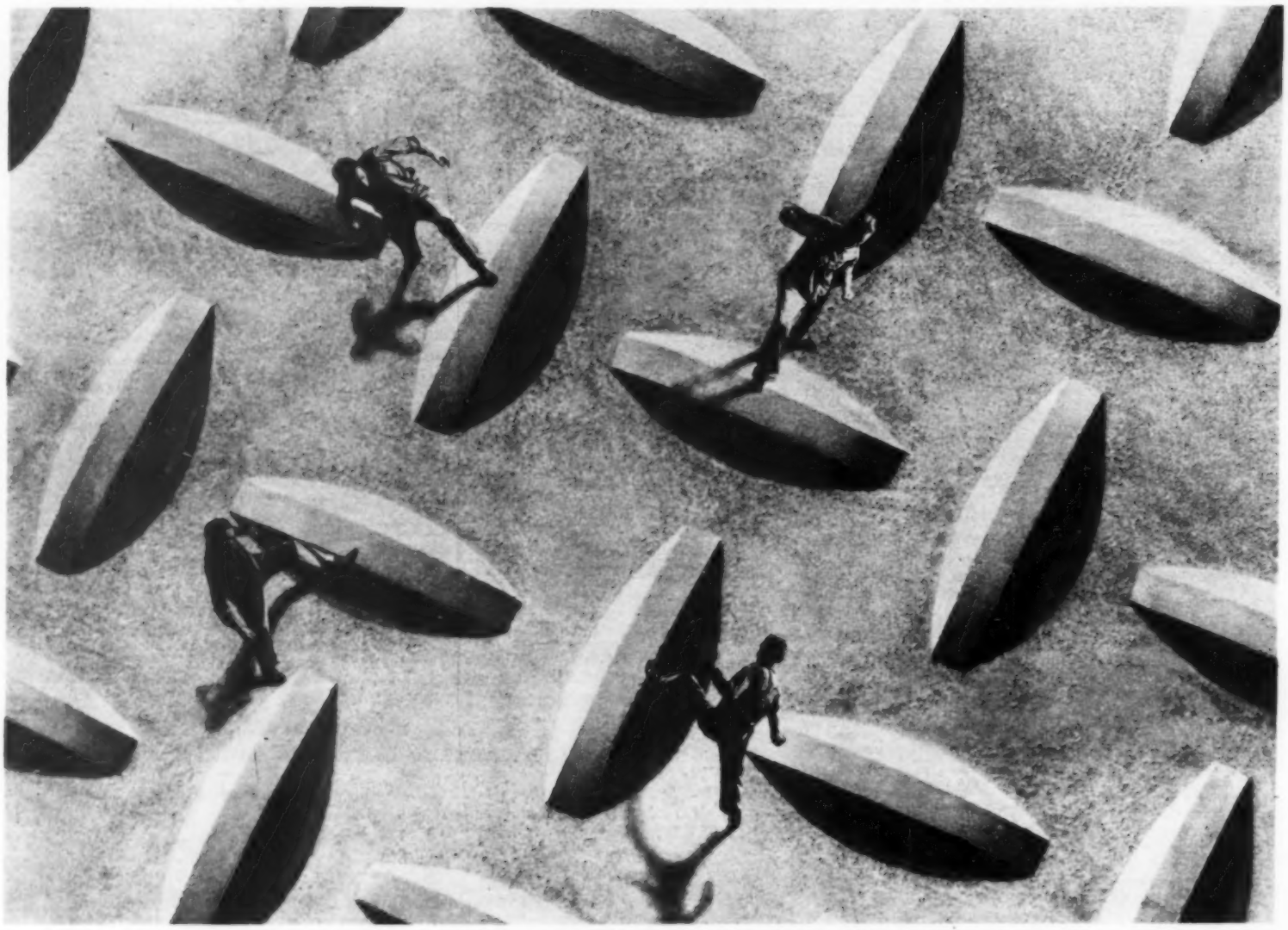
- ☐ "Forms for Architectural Concrete"
- ☐ "Beauty in Walls of Architectural Concrete"
- ☐ Information sheets on specifications and other details. (AC series, 1 to 13).

Name .....

Company .....

Address .....

City ..... State .....



Grips Foot or Tire 4-Ways

. . . Inland 4-Way Floor Plate

4-Way Safety

Extra Stiffness

4-Way Matching

4-Way Drainage

The most widely used floor plate is Inland 4-Way. It has earned this leadership since 1931 by offering 4 advantages in exclusive combination.

The Inland 4-Way Pattern (Patented) provides 4-Way Safety; the projections center one another at right angles, presenting equal traction all 4-ways instead of the usual 2. It matches 4-ways giving a continuous, neat, and safe pattern clear across the area covered. Since projections overlap equally 4-ways, it is equally stiff along all dimensions. And it drains and sweeps readily 4-ways.

Made in 3 patterns, differing only in the size of projections and ranges of thickness (minimum 16 gage for Light, up to ¾-inch for the Large Pattern) Inland 4-Way Floor Plate covers all requirements for steel safety treads. Leading warehouses stock it.

Write for the latest folder. Includes stimulating illustrations, describes all advantages. INLAND STEEL COMPANY, 38 So. Dearborn St., Chicago, Illinois.

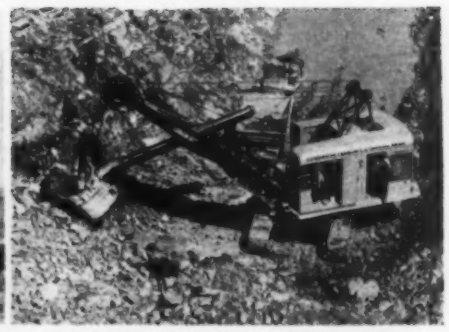
INLAND STEEL

Sheets Strip Tin Plate
Plates Structurals Piling

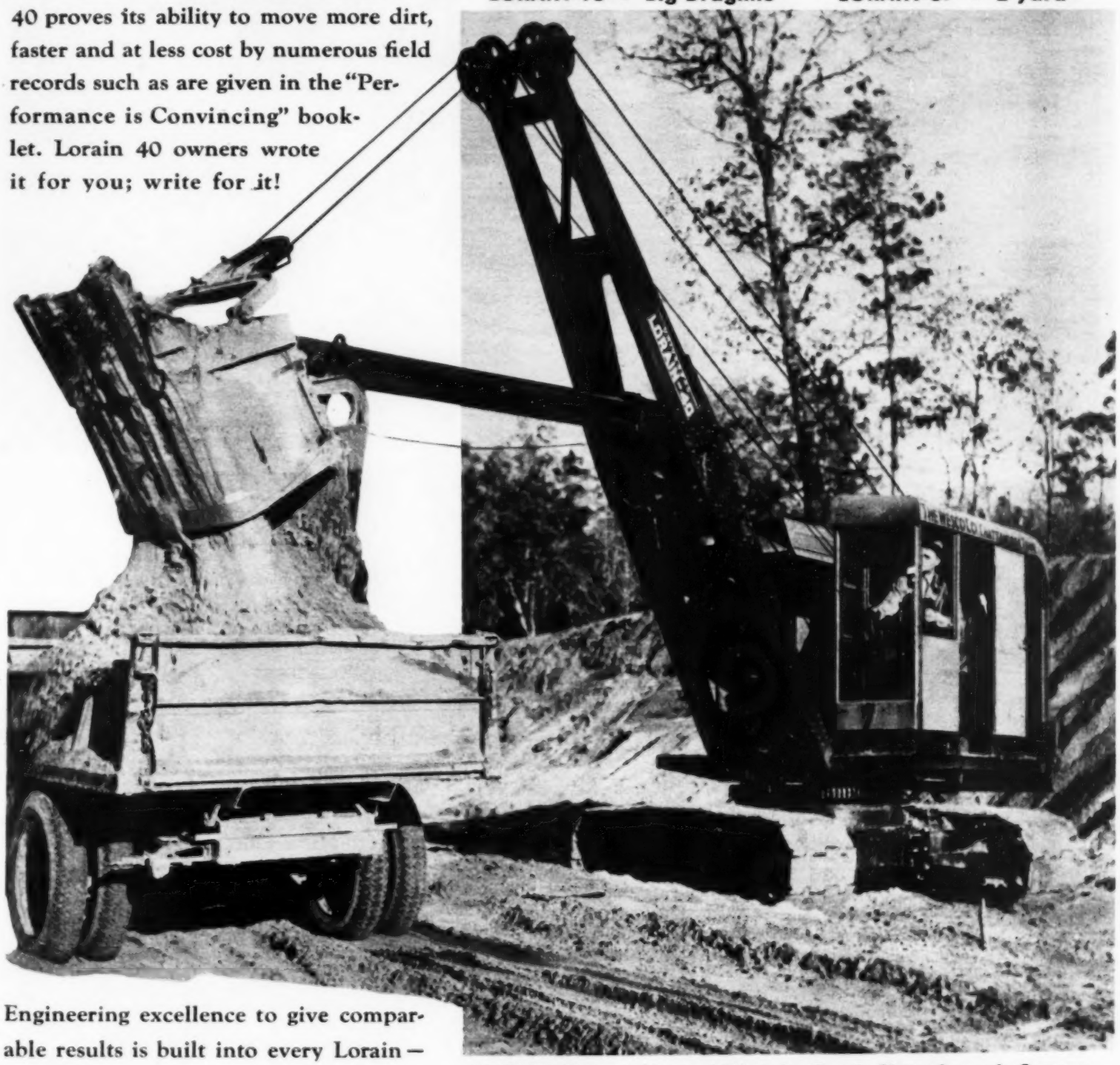
Rails Track Accessories
Bars Rivets Billets

A full measure, honest 3/4 yd. dipper on a shovel weighing 33,000 lbs.—with abundant digging power and real ranges—that's the 3/4 yd. Lorain 40. Built on the principle that Capacities depend on Stability and Strength, not Weight, the Lorain 40 proves its ability to move more dirt, faster and at less cost by numerous field records such as are given in the "Performance is Convincing" booklet. Lorain 40 owners wrote it for you; write for it!

LORAIN-95 • Big Dragline



LORAIN-87 • 2 yard

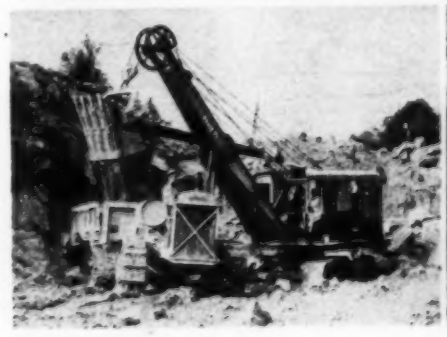


LORAIN-77 • 1½ yard Diesel Truck Shovels and Cranes

Engineering excellence to give comparable results is built into every Lorain—from the 2 yd. Lorain 87 to the 3/8 yd. Lorain 27 . . . Investigate Lorains, first!

THE UNIVERSAL CRANE COMPANY
THE THEW SHOVEL COMPANY

LORAIN OHIO



Los Angeles street showing Atlas White Traffic Marker after three years' wear. Marker installed by Inlay Marker Co., Long Beach, Cal., under supervision of the City Engineer, Los Angeles

. . . *cautions this white concrete marker*

WHITE concrete markers make good traffic cops. Good—and tough. They help keep traffic on the safe side. . . . Funny the respect people have for a straight white line!

The traffic marker of Atlas White shown in the picture has been on the job for over three years. And it will stay there—as white and efficient as it is now—as long as the pavement lasts. For Atlas White traffic markers are a permanent part of the pavement—built right into the asphalt, brick, or concrete.

They're made of solid white concrete, with a dense, solid, hard, white surface that *stays* white. Once installed, they're in for good. They never wear away, never fade out, never have to be replaced. There is no maintenance cost. Their first cost is their last cost. They're always on the job.

If you'd like to know more about these economical safety markers write—

UNIVERSAL ATLAS CEMENT CO.
UNITED STATES STEEL CORPORATION SUBSIDIARY
208 South La Salle Street • Chicago

Help Build Safety into Streets and Highways with Atlas White Traffic Markers • Made with Atlas White Portland Cement • Plain and Waterproofed

M-7

ATLAS WHITE TRAFFIC MARKERS

Construction Methods

ROBERT K. TOMLIN, Editor

Established 1919—McGraw-Hill Publishing Company, Inc. Volume 18—Number 3—New York, March, 1936

FLOOR SECTIONS *(right)* of catwalk are 6 ft. wide and 10 ft. long, supported by 1 9/16-in. wire rope cables spaced about 1 ft. apart.

SECTIONAL CATWALK *for Golden Gate Bridge*

CATWALK CONSTRUCTION, as a preliminary to spinning the huge suspension cables that will support the 4,200-ft. main span of the Golden Gate bridge, San Francisco, involves the use of sectional panels of redwood plank and steel channels to form the foot bridges.

The west footbridge consists mainly of 1¼x3⅜-in. redwood boards laid transversely to the center line of the bridge and supported by twelve 1 9/16-in. diameter wire ropes. The redwood boards are spaced by six 1⅝x3⅜-in. white spruce boards and four 5-in., 6.7-lb. steel channels running parallel to the center line of the bridge. The supporting ropes are spaced at about 1-ft. centers beneath the boards eliminating the usual heavy cross beams and stringers. The walk is 15 ft. 8 in. wide with flooring of 6-ft. boards on each side and a center strip of wire mesh under the cable.

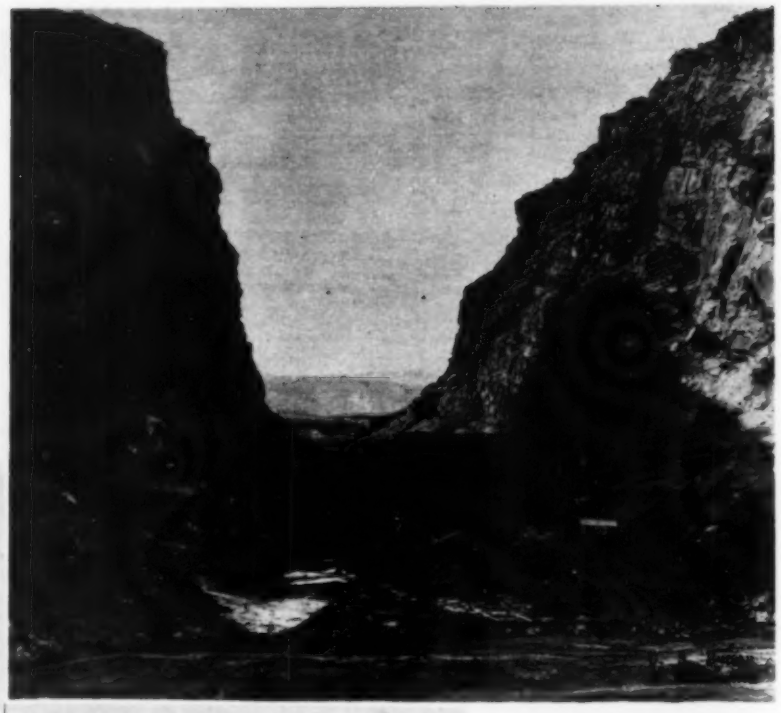
The east walk is widened 2 ft. on one side to provide a clear path for moving equipment and men and has thirteen supporting ropes. The walks are cleated except for the flat slopes at the center of the main span.

The board walk was slid out on the ropes in trains of about ten 10-ft. sections. One of the end sections of each train is stiffened by six light longitudinal steel trusses with lateral bracing. Each train is clamped independently to the ropes.

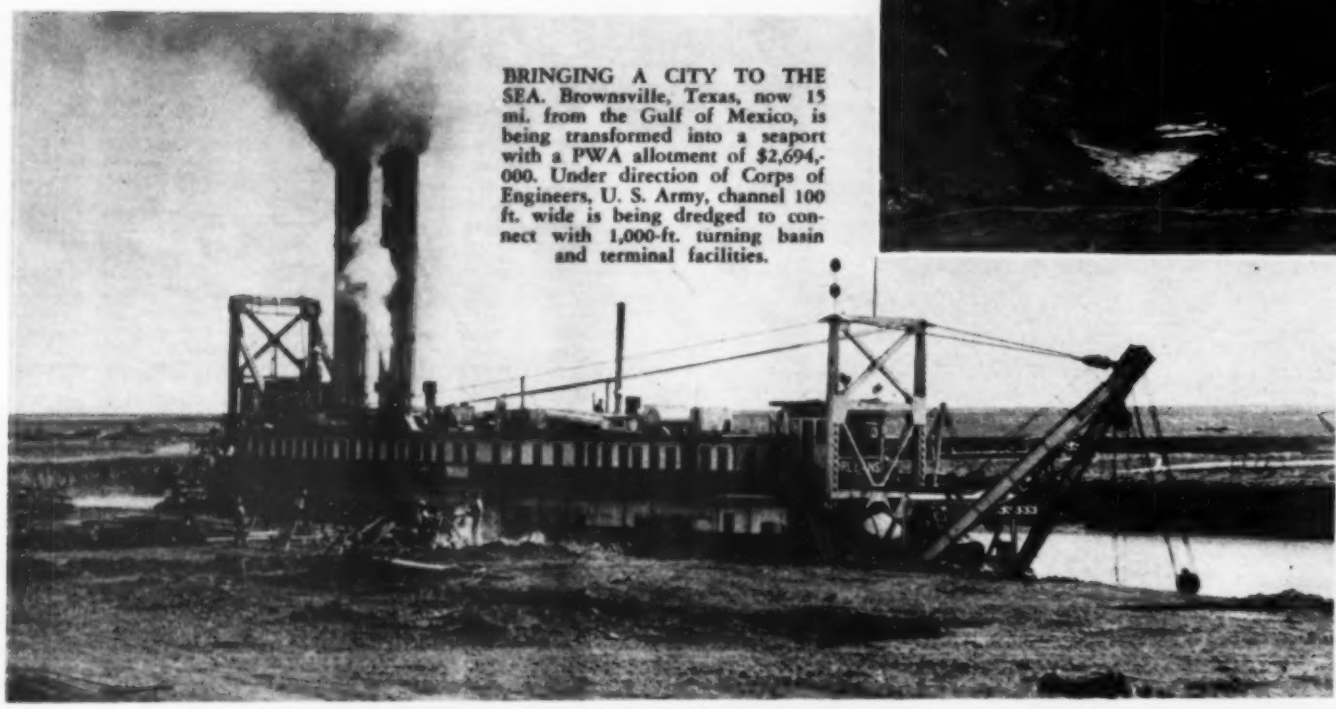
FOOTBRIDGE *(left)* 15 ft. 8 in. wide has flooring of 6-ft. boards on each side of wire-mesh center.

This Month's

"NEWS REEL"

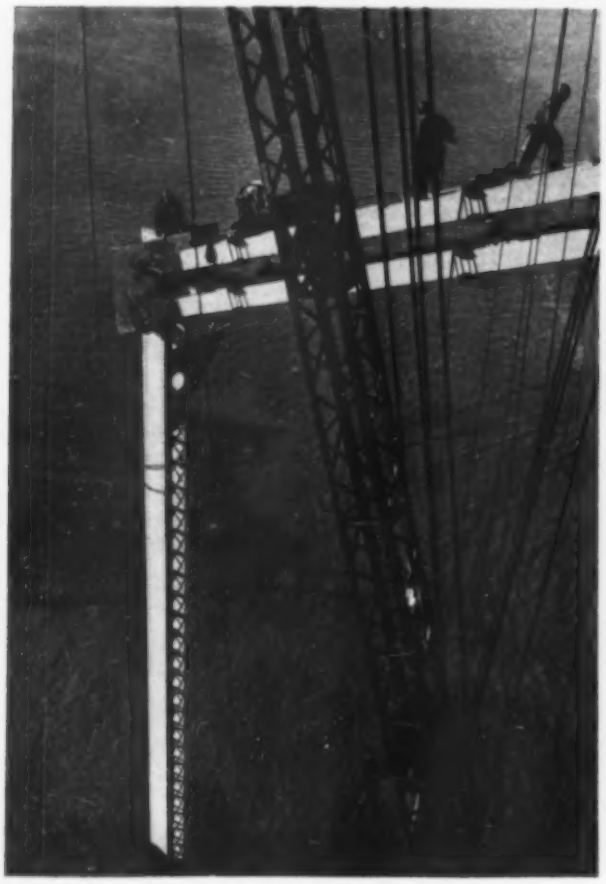


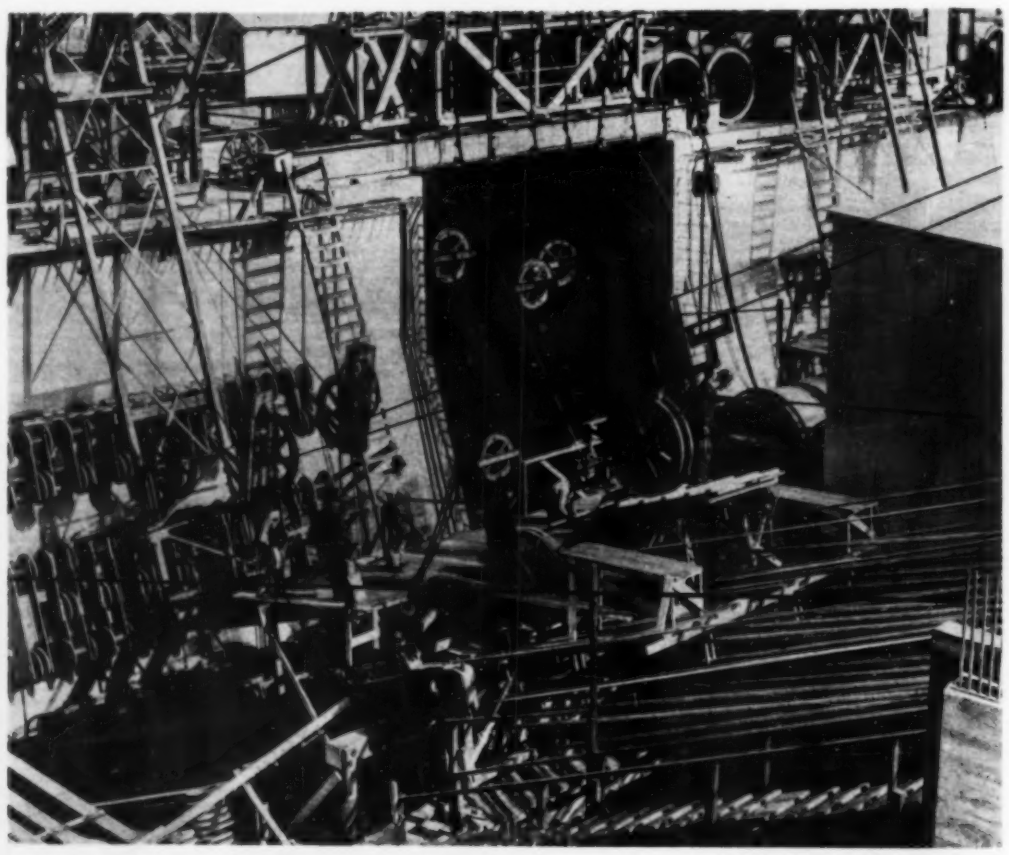
ALCOVA DAM SITE of U. S. Bureau of Reclamation's Casper-Alcova project in Wyoming witnesses start of construction by W. E. Callahan Construction Co. and Shirley & Gunther, under $1,483,000 contract. North Platte River has been diverted through tunnel completed under previous contract and excavation is under way for foundation of earth and rockfill dam 180 ft. high above river bed and 900 ft. long. Alcova dam will divert water for Casper canal. For Bureau of Reclamation H. W. Bashore is in charge as construction engineer.



BRINGING A CITY TO THE SEA. Brownsville, Texas, now 15 mi. from the Gulf of Mexico, is being transformed into a seaport with a PWA allotment of $2,694,000. Under direction of Corps of Engineers, U. S. Army, channel 100 ft. wide is being dredged to connect with 1,000-ft. turning basin and terminal facilities.

SIXTEEN EYEBARS *(below)*, extending diagonally outward from top of tower at Pier E-3 of San Francisco-Oakland Bay Bridge are attached to vertical steel member to complete first 50-ft. panel of 28 panels in 1,400-ft. cantilever span in east half of $77,600,000 structure.





CABLE SPINNING proceeds for 4,200-ft. main suspension span of Golden Gate bridge at San Francisco. Scene is at Marin anchorage, showing floating counterweights, eyebars, strand shoes, hauling drive equipment, wire reels containing 37 mi. of wire, duplex spinning wheel and 150-ton hydraulic jack. Seventeen completed strands are shown in right foreground. At current rate of progress 16 wires are strung between anchorages every 15 min.—*Photo, Golden Gate Bridge & Highway District.*

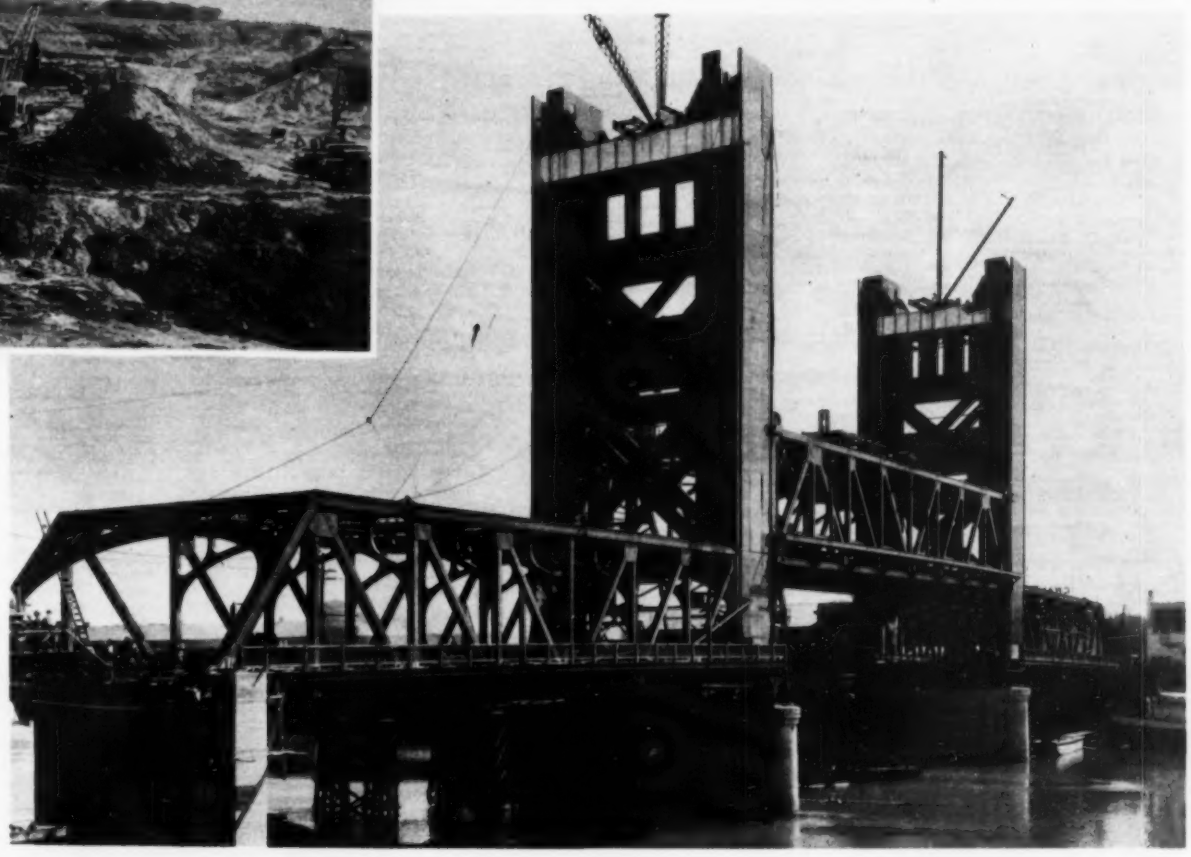
ROAD SHOW at Cleveland last January is inspected by group of officials and equipment exhibitors: (left to right) Col. Willard Chevalier, president-elect of American Road Builders' Association and vice-president, McGraw-Hill Publishing Co.; John W. Thomas, president, Firestone Tire & Rubber Co.; Charles M. Upham, engineer-director, A.R.B.A.; William P. McDonald, retiring president, A.R.B.A.; Harvey Firestone, tire manufacturer; and B. C. Heacock, president, Caterpillar Tractor Co.

Harris & Ewing Photo

FOUNDATION PILING is being put down at Washington, D. C., for huge new Department of Interior building to cost about $9,258,000. General contractor is George A. Fuller Co., of Washington, working under direction of Office of Supervising Architect, Treasury Department.

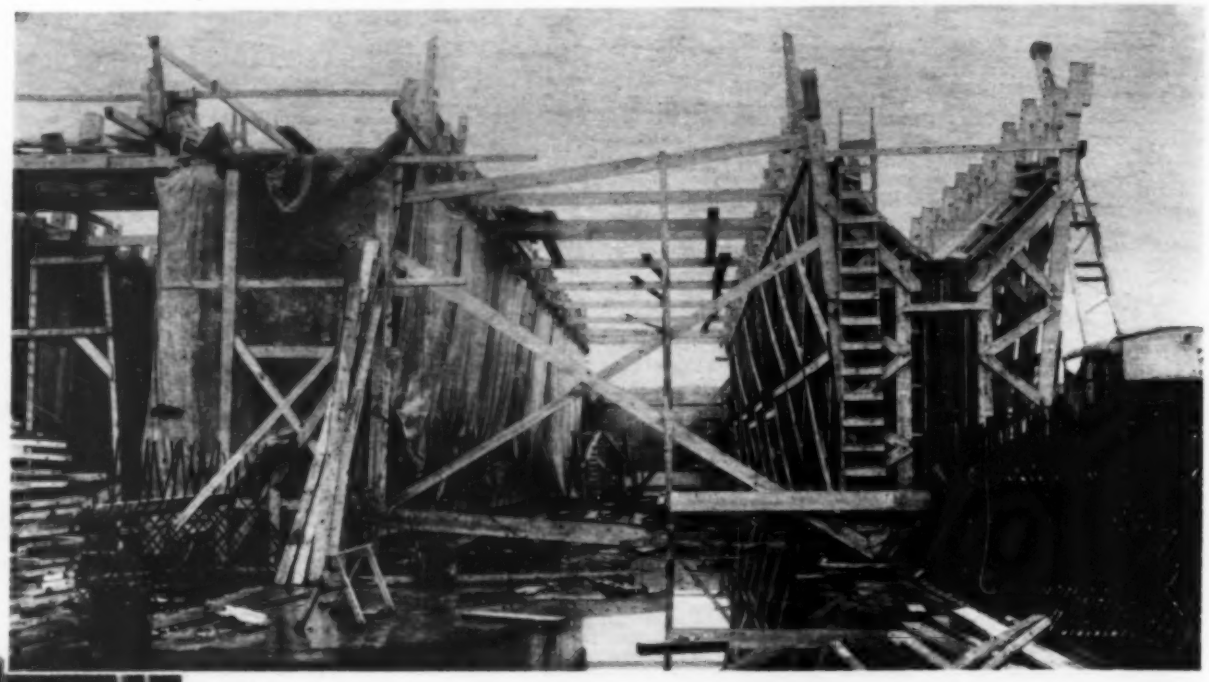
SAVANNAH BLUFF LOCK AND DAM *(right)* is under construction within cellular steel sheet-pile cofferdam on Savannah River, Georgia, as million-dollar project for improving navigation by Corps of Engineers, U. S. Army. General contractor, Arundel Corp., Baltimore.

LOUP RIVER PROJECT *(above)*, involving diversion dam, high line canal reservoirs and hydroelectric plants, is under way in Nebraska to develop power with aid of PWA loan and grant of $8,700,000. View shows construction of concrete siphon on line of canal under Looking Glass Creek, near Genoa, Neb., by Abel & Dobson, contractors, of Lincoln, Neb.

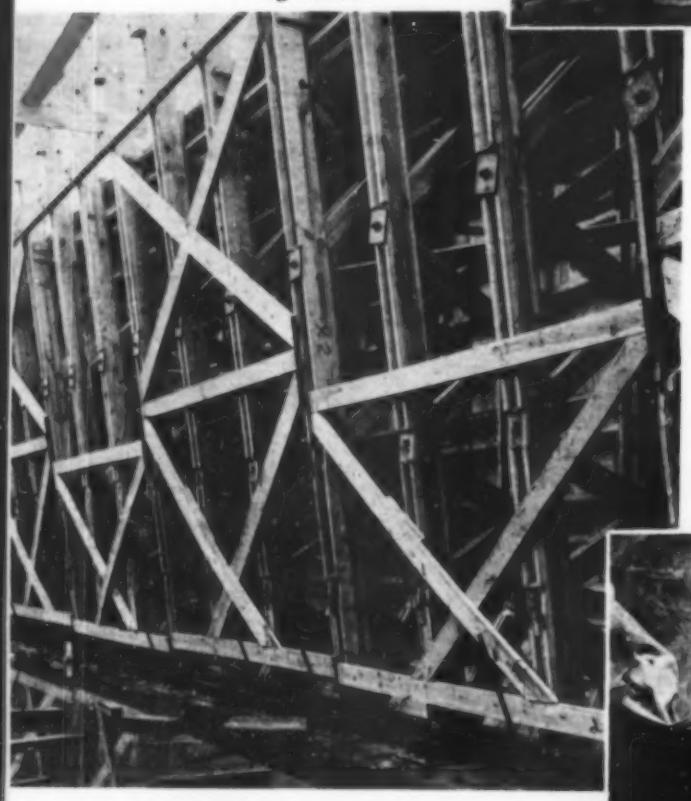


LIFT BRIDGE *(right)* spanning Sacramento River at M St., is completed by George Pollock, contractor, as joint project for California Division of Highways and City of Sacramento, at cost of $994,000. Structure 737 ft. long combines use of steel and concrete and has central lift span in form of 202 ft. counterweighted truss supported by towers 160 ft. high, providing 97-ft. clearance when raised.

CENTRAL MIXING and batching plants, from which industrial railway and truck mixers, respectively, distributed concrete to aeration tanks and final settling tanks of the new Columbus, Ohio, sewage treatment works, served the Bryant & Detwiler Co., of Detroit, and the North-Eastern Construction Co., of New York City, in executing their separate contracts for these structures under the direction of the Division of Engineering & Construction of the city's Department of Public Service.



TRUSSED TIMBER FORMS *(right)* **support freshly placed concrete in Y-shaped walls of aeration tanks. Canvas tarpaulins and live steam keep concrete warm and moist during curing period in freezing weather.**



WALL FORMS in sections 12 ft. long and 16¼ ft. high, weighing 2 tons each, are anchored to base plates on concrete channel floor.

INDUSTRIAL RAILWAY *and* TRUCK MIXERS

Distribute Concrete to Batteries of Sewage Treatment Tanks

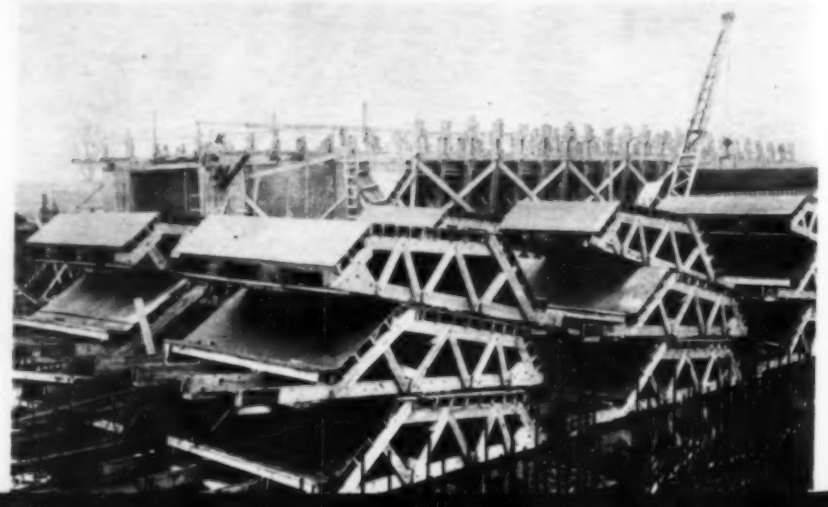
The two types of tanks are located on adjacent sites inside a roughly rectangular construction area, surrounded on four sides by earth levees which protect it from floods in the nearby Scioto River. Starting work on its contract late in July, 1934, the Bryant & Detwiler Co. laid an underground pipe drain below the level of the pipe gallery at one end of the aeration tanks and installed a 12-in. well pump to remove water collected by this drain. This drainage system lowered the groundwater table about 12 ft., providing a dry bottom for the deepest concrete, and incidentally eliminated all groundwater problems from the program of the North-Eastern Construction Co. when it undertook its contract about three months later.

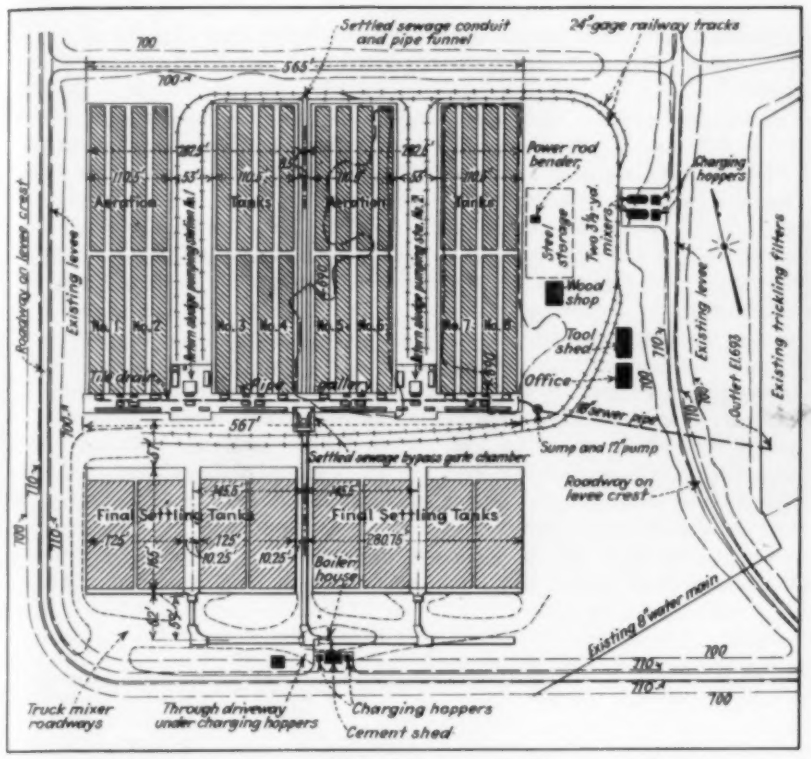
To supply the large volumes of concrete required for the aeration tanks the contractor mounted two 3½-yd. mixers (designed originally for use as truck mixers) in a stationary plant alongside the levee. For the smaller quantities of concrete needed in the final settling tanks the North-Eastern organization operated three 1-yd. truck mixers which received dry batches and water at a central plant similarly erected against the side of the levee. Batched materials were delivered to the two plants by dump trucks which hauled over roadways on the crest of the levee.

By locating the central batching and mixing plants against the side of the levee embankment the contractors obtained gravity flow of batched materials from the trucks, which dumped into hoppers on a level with the roadway. At the aeration tanks the hoppers fed the dry batches into the 3½-yd. mixers which, in turn, discharged into concrete buckets on railway flat cars. On the settling tank contract the batches were released from the hoppers

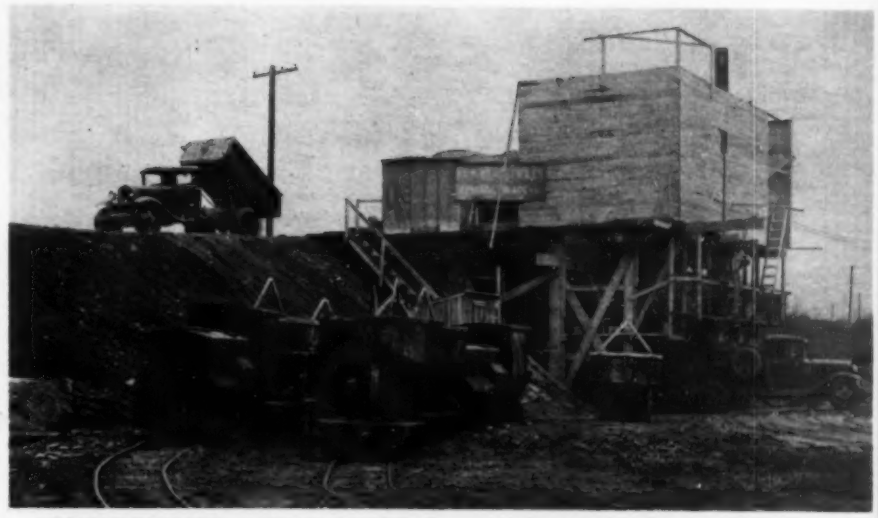
BASE OF WALL FORM is tied down to steel angles attached by anchor bolts to concrete channel floor. Horizontal bolts provide for final lateral adjustment of base of form. Vertical bolts for height adjustment are not visible.

FIBER-BOARD LINING ***(below)*** **is applied to pre-fabricated wall-form units, as well as to forms for all other exposed concrete surfaces.**

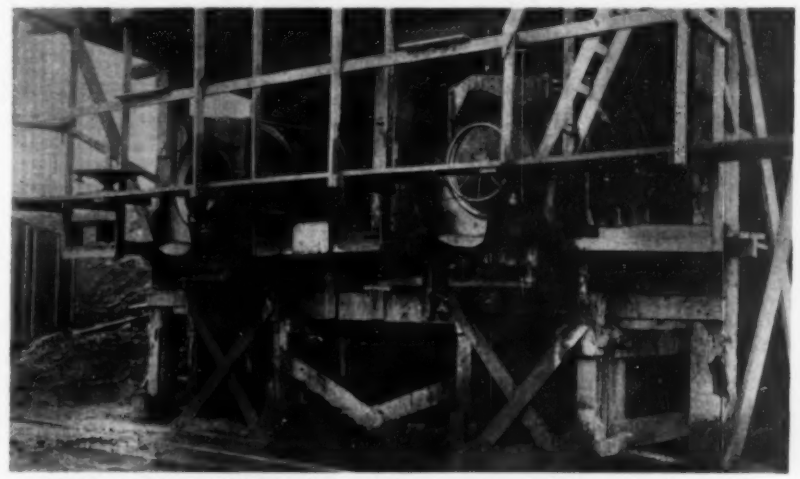




ROADWAY ON CREST OF LEVEE surrounding construction site carries material trucks delivering cement and aggregates to mixing plant for aeration tanks and to batching plant for final settling tanks. Industrial railway distributes concrete to aeration tanks; truck mixers deliver mixed batches to settling tanks.



MIXING PLANT erected against side of levee takes batched materials from trucks on upper roadway and passes them through hoppers and 3½-yd. mixers to concrete buckets on flat cars of two industrial trains. For outlet conduit, dump-body truck hauls concrete from mixer, as indicated here.



TWO 3½-YD. MIXERS, designed for mounting on motor trucks, are set up in stationary plant. Mixers turn each batch through 75 revolutions at 12½ r.p.m.

into the 1-yd. drums on the trucks.

Treatment Works — Designed to take care of 50,000,000 gal. of sewage per day in times of normal flow and a maximum of 100,000,000 g.p.d. during storms, the Columbus plant embraces three elements necessary to give complete treatment: (1) Screens and grit chambers; (2) settling tanks and sludge digestion tanks; and (3) aeration tanks and final settling tanks. In dry weather, no sanitary sewage flows directly into the river. The plant is the culminating feature of Columbus' $13,000,000 sewerage and sewage disposal program being financed by PWA loans and grants.

Aeration Tanks—Eight aeration tanks were constructed in four groups of two units each; each pair is 110 ft. wide by 371½ ft. long. At one end of the eight units is a pipe gallery 34 ft. wide and 565 ft. long. Walls of the aeration tanks are 16¼ ft. high above the concrete floor.

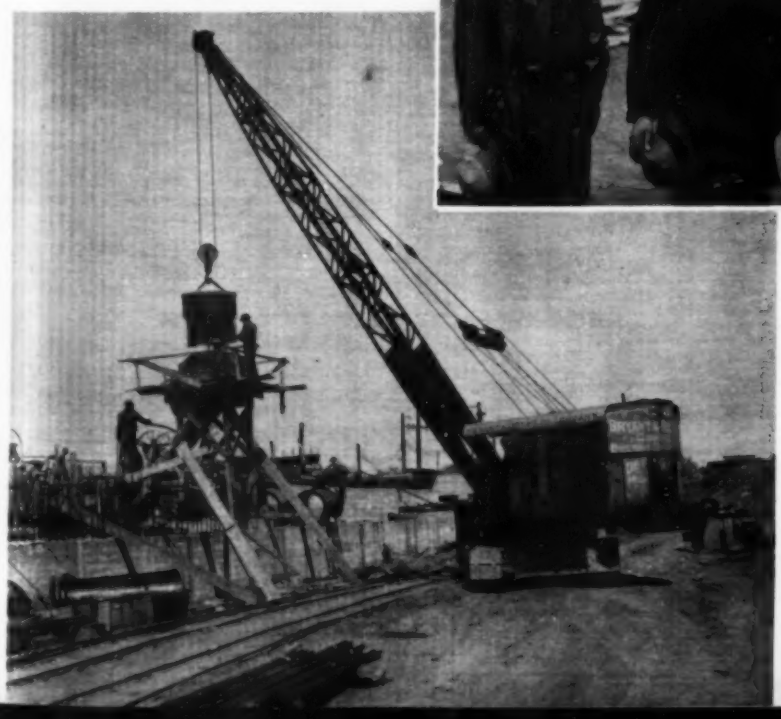
Groundwater level at the site of the disposal plant was at El. 688, or 2 ft. above normal low-water stage in the Scioto River. The invert of the main drain under the pipe gallery is at El. 677.6. Concrete extends about 1 ft. below this level to El. 676.6.

To place this concrete in the dry, it was necessary to lower the groundwater level 12 ft. The contractor laid a tile sub-drain (18 in. to 8 in. in diameter) 565 ft. long at El. 674 under the line of the main drain and connected the sub-drain into a sump from which water was pumped by a new type Fairbanks-Morse non-clogging, open-vane well pump with a capacity of 4,000,000 g.p.d. against a 21-ft. head. A 42-in. casing driven to El. 666 formed the sump in which the pump was set. The intake to the pump was at El. 674, on a level with the tile sub-drain. A 1-in. screen at the intake rejected gravel more than 1 in. in diameter, but the pump was designed to handle anything of smaller size. The pump, driven by a 40-hp. electric motor, operated continuously for almost two months before the water level was lowered sufficiently to permit concreting of the main drain in the dry. High porosity of the material surrounding the site caused rapid infiltration of water and accounted for the delay in lowering the groundwater table.

Excavation of 30,000 cu. yd. of sand and gravel was involved in the contract for the aeration tanks and pipe gallery. The structures required 30,000 cu. yd. of concrete, of which 29,500 yd. was class A and 500 yd. class B. In addition, 49,000 sq. ft. of precast concrete slabs was needed to cover the pipe troughs in the tops of the aeration-tank walls.

Monolithic concrete pours ranged up to 500 cu. yd. in volume. To produce concrete in this quantity the contractor erected against the levee embankment at one side of the site a mixing plant containing two 3½-cu. yd. Jaeger mixers of the type designed for mounting on truck chassis. Specifications required that each batch be given 75 revolutions of the mixer drum which turned at a speed of 12½ r.p.m On large concrete pours the plant averaged more than 40 cu. yd. an hour.

CRAWLER CRANE *(below)* lifts 35-cu. ft. bucket from flat car and discharges concrete into deck hopper on aeration tanks for distribution by hand carts.



CONSTRUCTION SUPERVISORS. (Left to right) W. J. Seidensticker, field engineer for city, and J. G. Campbell, superintendent for Bryant & Detwiler Co., on aeration tanks; J. H. Blodgett, chief field engineer, Columbus Department of Public Service; and W. M. Robinson, superintendent on outlet conduit for Bryant & Detwiler Co.

AT FINAL SETTLING TANKS, crane handles 30-cu. ft. bottom-dump bucket into position for placing concrete.

Five dump-trucks hauled single batches for the 3½-yd. mixers a distance of 3½-mi. from a commercial batching plant, carrying the 20 cu. ft. of cement for each batch in a separate container at the rear of the truck body. These cement containers were equipped with screw-operated bottom gates designed to prevent opening in transit and to permit control of cement discharge when dumping at the plant. The trucks dumped their loads into open hoppers on a level with the crest of the levee. From the hoppers the batches passed into the mixer drums.

Concrete was discharged by the mixers directly into 35-cu. ft. buckets on narrow-gage flat cars. Two trains drawn by Plymouth gasoline locomotives, each hauling three 35-cu. ft. buckets, distributed the concrete from the mixing plant to the aeration tanks and pipe gallery. Ordinarily, one train took care of each mixer.

A Lorain crane picked up the concrete bucket from the narrow-gage car and discharged the mixture into a floor hopper on top of the wall forms. Most of the concrete was distributed from the floor hoppers by hand carts, but a small part of the total volume was placed directly in the forms from the buckets. Concrete for some outlying structures, such as the outlet conduit, which the same contractor built under separate contract, was transported from the central mixing plant by dump trucks. The photographs illustrate this method of handling concrete for the outlet conduit.

Aeration-Tank Forms—An accompanying drawing of the aeration-tank forms indicates the shape of the tank walls, which have a broad base, a vertical center section and a Y-shaped top. Exterior walls and dividing walls of the aeration tank units are made 18 in. thick, and intermediate walls inside the tanks have a thickness of 12 in. The troughs in the tops of these intermediate walls carry pipe lines supplying compressed air for the aeration process; these troughs are covered with precast slabs to permit ready inspection of pipes. The concave surface of the tank walls, typical of modern aeration tank design, is intended to impart a spiral flow to the aerated sewage as it flows through the tank.

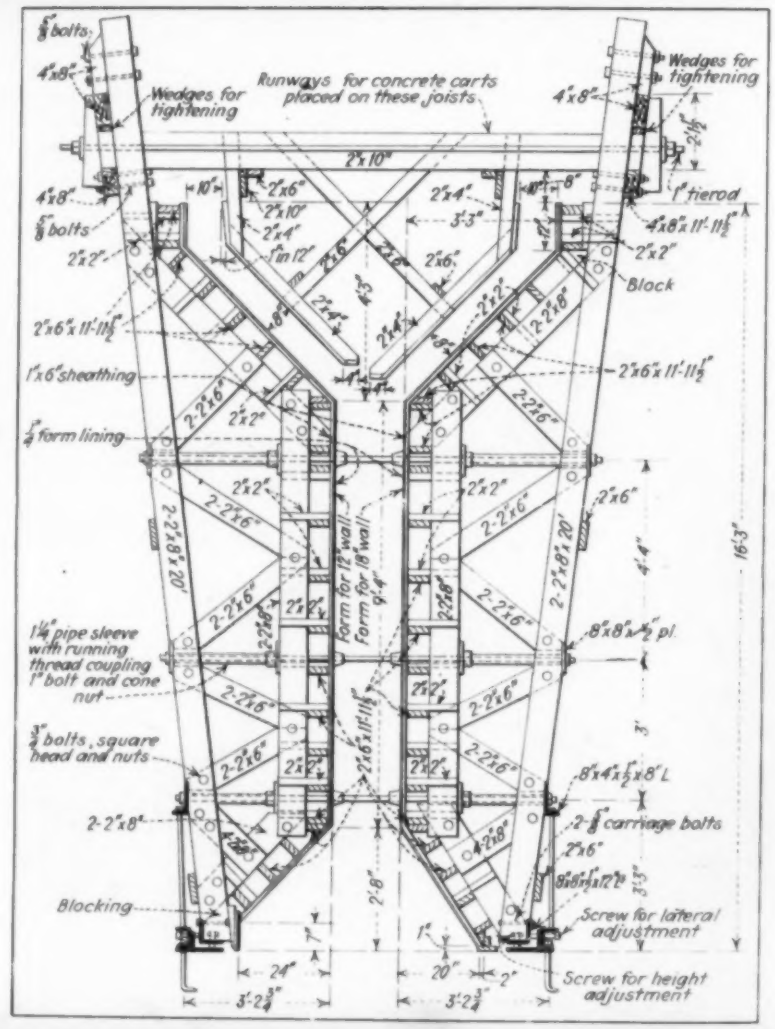
Interesting problems were involved in the design of the aeration tank forms. Construction joints running transversely across the tanks at three points divide the units into three sections about 100 ft. long and an end section (at the north end) about 67 ft. long. The contractor equipped the job with forms for 500 ft. of aeration tank walls, sufficient to concrete an entire 100-ft. section of one pair of tanks.

Wall forms were constructed of wood in sections 12 ft. long weighing about 4,000 lb. each. As indicated by the drawing, the framework for the wall forms consists of strongly built timber trusses designed in accordance with accepted practice for this type of construction. In the anchorage, however, certain improvements were made. Base plates, with attached angles for bolting, were anchored to the concrete channel floor when cast. The wall forms were held down by vertical threaded rods secured to the bolting angle of the anchorage. In addition to this attachment, the anchorage provided a horizontal bolt through the angle leg to make final lateral adjustments in the base of the form. This horizontal bolt acted against the upright leg of a steel angle at the base of the form. The horizontal leg of this steel angle carried bolts which provided for final vertical adjustment of the form.

A Universal truck crane traveling on the concrete channel floor picked up and transported the 2-ton form sections. In common with the forms for all other exposed concrete surfaces on the job the aeration-tank wall forms and trough forms were lined with ¼-in. Masonite tempered Presdwood. Up to the time when about 60 per cent of the concrete was in place, the contractor had purchased 46,000 sq. ft. of this form lining.

Outlet Conduit—A reinforced-concrete outlet conduit of circular section

TRUCK MIXERS discharge mixed batches into bucket on load line of crawler crane.



AERATION TANK WALL FORMS *(right)*. Form at left is for 12-in. intermediate wall; form at right is for 18-in. dividing and exterior walls. Note bolts at base for horizontal and vertical adjustment of form.

7 ft. in diameter was constructed under a separate contract by the Bryant & Detwiler Co. from the sewage treatmen works to the Scioto River, about ½-mi. distant. Before setting a form for the lower half of the conduit, the contractor cast concrete haunches along the two edges of the trench and placed precast concrete blocks at each end of the form. Tierods cast in the concrete haunches prevented flotation, and the blocks supported the form. Semicircular steel forms served in the construction of both invert and arch. Wood forms, made up of wood sheathing on semicircular channel rings, were used for the outside of the arch.

Final Settling Tanks—Four pairs of conveyor-type final-settling tanks, measuring in plan 165x125 ft. per pair, with an effective depth of 17 ft., were constructed under the contract of the North-Eastern Construction Co. This contractor erected a charging plant for truck mixers against the side of the levee embankment midway of the four pairs of tanks. Three-batch trucks, hauling batched aggregates for the 1-yd. truck mixers 1 mi. from a commercial plant, backed a short distance across a level platform from the levee roadway and dumped the materials into hoppers which charged the truck mixers. Sacked cement was delivered by truck to a cement shed on the platform, and the cement was dumped by hand out of the sacks into the charging hoppers. The layout of the charging plant and of the truck-mixer roadways is shown on an accompanying plan.

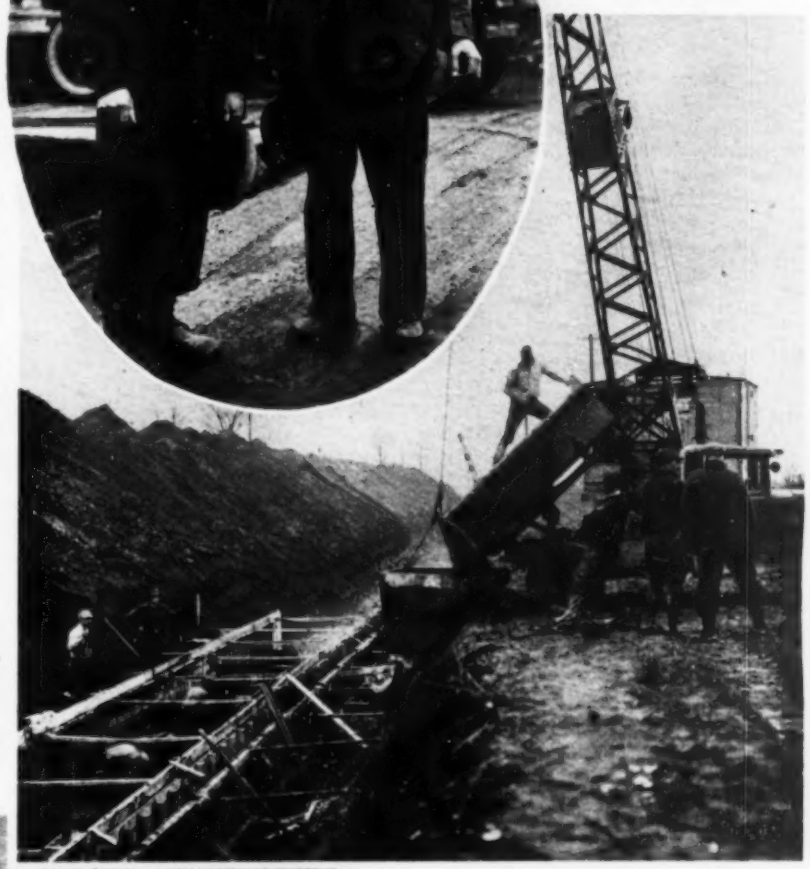
Sand and gravel excavation at the site of the final settling tanks amounted to about 35,000 cu. yd. The total volume of concrete involved was about 10,000 cu. yd., and the structures were reinforced with 824 tons of bar steel. Three 1-yd. Jaeger truck mixers distributed concrete to the settling tanks. The mixer drums revolve at 18 r.p.m., and the batchmeters are set for 50 revolutions. Concrete pours for the bottom slab of the settling tanks amounted to about 150 yd. each. In placing this concrete, three truck mixers averaged about 20 cu. yd. per hour, enabling the contractor to complete a 150-yd. pour in an 8-hr. shift.

Concrete was discharged by the truck mixers into a circular, bottom-dump concrete bucket which had its original 1-yd. capacity increased to 30 cu. ft. by the addition of a 2¼-in. lip plate around the top. A Koehring crane handled this bucket into position for dumping.

Winter Concreting — Specifications relating to the placing of concrete in cold weather stated that between temperatures of 40 deg. and 25 deg. F. concrete might be mixed and placed subject to special requirements.

Heating either by free steam or by an inclosed steam system was permitted. As a matter of fact, the contractors on the aeration tanks and final settling tanks, as well as on all other projects built by the Columbus Department of Public Service during the last few years, utilized free steam to heat the concrete, because this method keeps the surface of the concrete wet. For the last three or four years, all concrete aggregates for public contracts in Columbus have been batched at tipples of commercial plants equipped to heat the aggregates either by steam coils or by free steam.

IN CHARGE *(left)* of construction at final settling tanks. I. E. Scott (left), senior assistant engineer, Department of Public Service, and M. C. Johnson, superintendent, North-Eeastern Construction Co.



OUTLET CONDUIT is built with concrete hauled by dump truck from mixing plant and placed by hopper-type bucket. Contractor builds concrete haunches before placing forms for lower half of circular conduit.

TARPAULINS AND LIVE STEAM protect haunches in cold weather until concrete has cured.

BATCH TRUCK *(left)* backing over level platform from road on levee crest dumps aggregates into charging hopper for delivery to truck mixer on lower level. Sack cement is dumped by hand into charging hopper from door of cement shed. Batching plant has similar arrangement for gravity charging at other end of cement shed.

To heat the mixing water for the two 3½-yd. mixers at the aeration tanks, the Bryant & Detwiler Co. used a 30-hp. vertical fire-tube boiler. Another boiler of the same size and type set up in the construction area supplied live steam through perforated pipes to keep warm and moist the fresh concrete in the aeration tanks and pipe gallery. This concrete was covered by fifty tarpaulins of 15x20-ft. size — a quantity sufficient for the winter rate of concreting on the contract.

At the final settling tanks, the North-Eastern Construction Co. installed a 10-hp. boiler at the truck-mixer charging plant to heat the mixing water before it was admitted to the tanks on the trucks. A 35-hp. vertical boiler set up in the working area supplied live steam to cure the concrete, which was protected with canvas tarpaulins. The contractor had on the job 42 tarpaulins of 16x20-ft. size.

Administration—For the City of Columbus, P. W. Maetzel is chief engineer and R. A. Allton is sewage disposal engineer. J. H. Blodgett, chief field engineer, is in charge of all construction at the sewage treatment work. The contract for the aeration tanks was under the direction of W. J. Seidensticker, field engineer, and the work on the final settling tanks and outlet conduit was performed under the supervision of I. E. Scott, senior assistant engineer.

For the Bryant & Detwiler Co. of Detroit, J. G. Campbell was superintendent in charge of the aeration tanks, and W. M. Robinson was superintendent in charge of the outlet conduit. Construction of the final settling tanks was directed for the North-Eastern Construction Co., of New York City, by M. C. Johnson, superintendent.

Step-by-Step Field Methods

CONCRETE HOUSE *Built With* STEEL PANEL FORMS

TO DEMONSTRATE that a small house can be well designed and soundly constructed at moderate cost, the Lone Star Cement Corp. has completed a two-story reinforced concrete dwelling, 27x30 ft. in plan, with attached garage, on South Claiborne Ave., between Octavia and Joseph Sts., New Orleans. The reproduction cost of the structure, built by the Perrilliat-Rickey Construction Co., local contractor, is said to be between

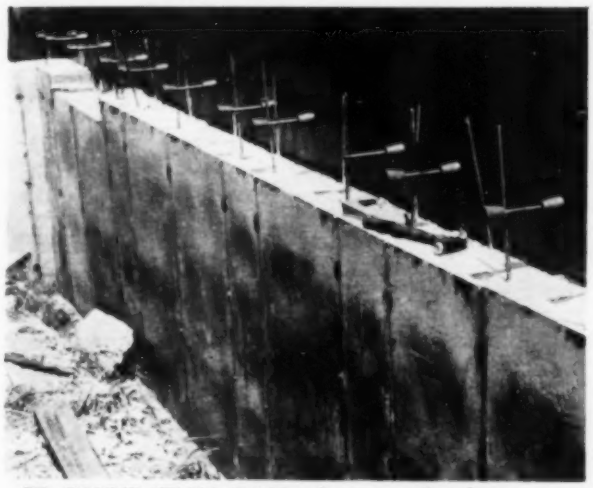
LONE STAR HOME ***(left)*** **is two-story reinforced concrete structure of modern design built to demonstrate possibilities of construction of this type at moderate cost.**

1 HEAVY FOOTINGS *(left)* were required because of low bearing value of New Orleans soil at site of house. Concrete is being poured upon 4-in. sand cushion.

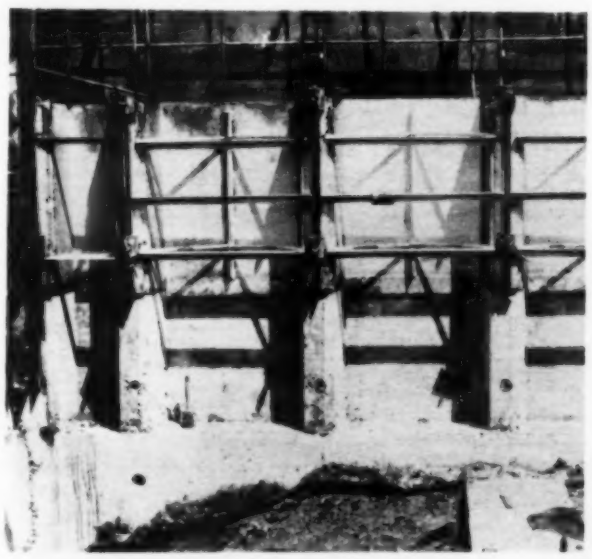
2 FOUNDATION WALLS *(below)* are 8 in. thick. Standard straight form panels of steel are used. In backgroumd note staggering of outside form panels to provide rigidity and vertical alignment.

3 FORM UNITS for exterior surface of wall are steel panels with holes to accommodate spacer bolts. Wedges through eyes in ends of bolts hold U-clamps which draw adjacent form panels together and also retain strap carrying thumbscrew that holds longitudinal angle-iron walers in place. U-clamps insure vertical alignment while walers, spaced 2 ft. apart, provide horizontal alignment. Note staggering of form sections.

4 OUTSIDE STRAIGHT PANELS in place at corner of foundation wall. Spacer bolts with cones and reinforcing steel are in position. Horizontal steel bars are carried on spacer bolts. Cones are adjusted to provide correct wall thickness and assembly is ready for inside form.



5 FOUNDATION WALL of concrete has been poured and inside forms removed. First-floor slab and ribbed walls of first story will be erected on this wall. Top row of cones is still in place to serve for attachment of first-story wall forms.



6 RIBBED WALL SECTION is completed for first lift and 2-ft. starting section of forms is removed. Outside straight panel forms have been run up to two-story height. Inside ribbed forms are carried up in lifts as concreting of wall proceeds.

$8,500 and $10,000. As planned by Weiss, Dreyfous & Seiferth, architects, and George P. Rice, structural engineer, all of New Orleans, the working part of the house is at the front and the living quarters in the rear, away from street noises and overlooking an attractive garden. The building has no basement. The first floor plan provides for a large combined living and dining room (12ft.10in.x28ft.8in.), kitchen, utility room, entry, storage room, garage and terrace. On the second floor are two bedrooms, bath, balcony, solarium and sun deck formed by the roof of the garage.

Exterior treatment is modern. The smooth concrete walls are sprayed with two coats of white cement and the front facade is relieved by black terrazzo-concrete spandrels between casements and over the front door, giving the effect of continuous openings. A feature of the interior is a concrete staircase cantilevered from the walls and second floor. For the footing and walls of the house ordinary Lone Star cement was used but for the second and third floors Incor high-early-strength cement was employed to expedite form stripping.

Noteworthy in building the ribbed concrete walls of the house was a system of Simplex steel forms made up of flat exterior sections and arched interior sections fastened together to produce a self-aligning wall. These forms require no outside bracing. Form costs on the structure are reported to be only 40 to 50 per cent of the estimated cost of using wood forms.

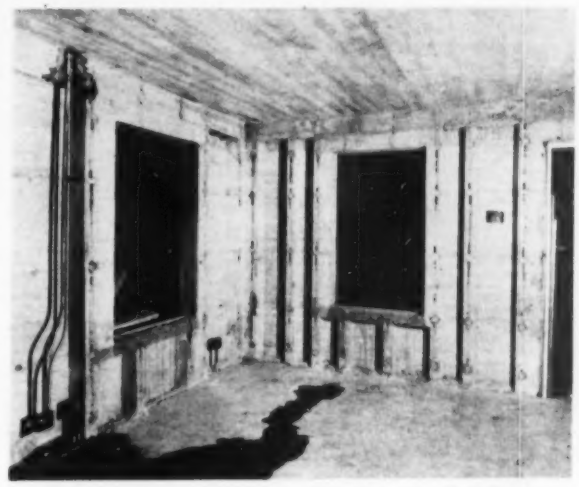
Structural Features—Because of the low bearing value of New Orleans soil it was necessary to support the house upon a reinforced concrete footing 10 in. thick and varying in width from 3½ to 7 ft. under the outside walls. Foundation walls are 8 in. thick and 4½ ft. high, reinforced.

Exterior walls are of ribbed reinforced concrete made up of a 3-in. slab with ribs 5 in. deep by 4 in. wide, spaced 24, 18 or 12 in. on centers. The rib construction provides a rigid wall of high load-carrying value and transverse stability which, at the same time, produces air space for insulation and accommodation of pipe and electric conduits. Nailing strips in the rib soffits permit attachment of interior finish, consisting of plaster applied to 1-in. rigid insulation board. The load-bearing partition in the first story is of 8-in. concrete. Non-load-bearing partitions are built of metal studs, metal lath and solid plaster 2½ in. thick.

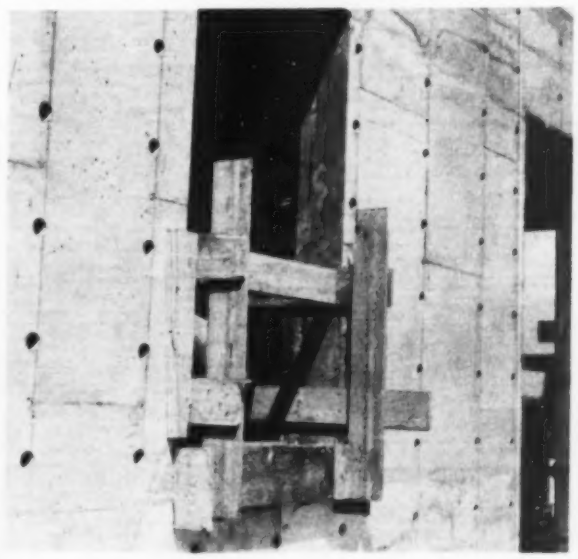
As there is no basement, the 4-in. slab for the first floor was placed on earth fill. Second floor and attic slabs also are 4 in. thick of reinforced concrete, poured in wood forms.

Concrete was purchased from a central mixing plant and delivered in transit-mix trucks dumping into hopper feeding wheelbarrows. For the floor slabs a 5½-bag mix, approximately 1:2¼:3½, with 1½-in. maxi-

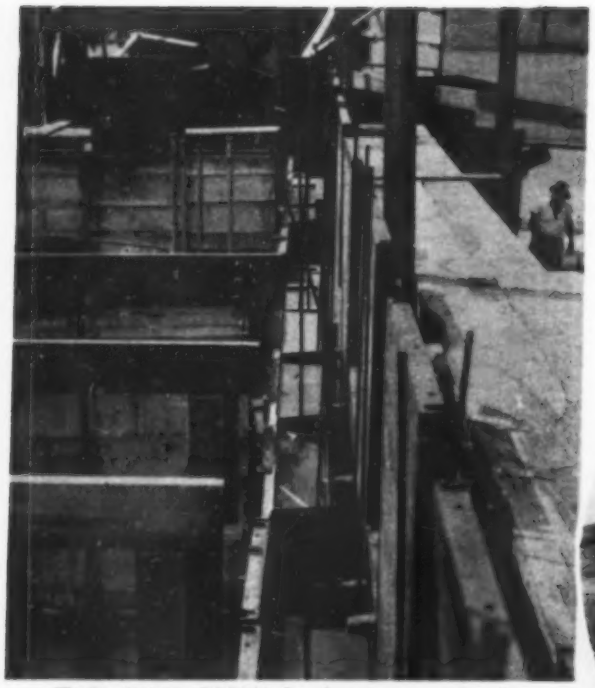
7 REMOVAL OF SPACER BOLTS, after stripping forms, is done with tool like screw-driver which fits into slot in cone heads. After cone is unscrewed, bolt with sliding weight is screwed into other cone. A few taps of weight against bolt head removes remaining cone and spacer bolt. Cone holes are then filled with mortar.



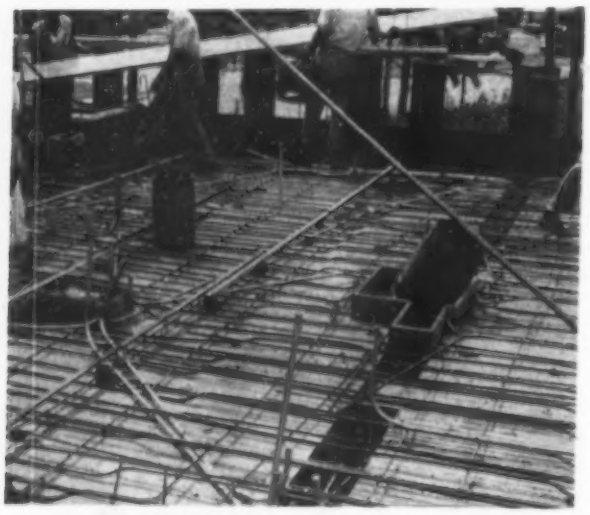
8 RIBBED WALL facilitates placing of electrical conduits, plumbing and other service connections. Ribbed spacing is varied to accommodate these mechanical installations.



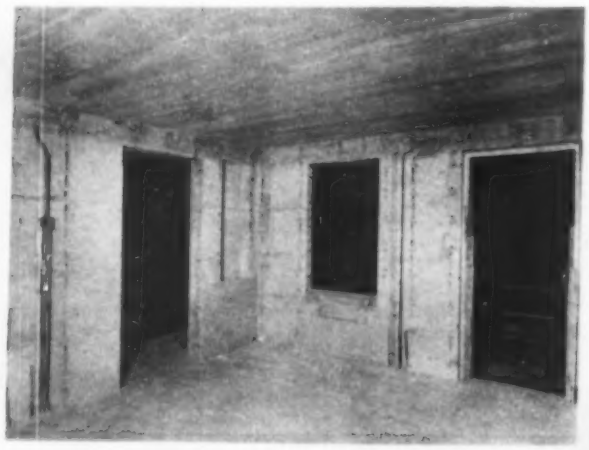
9 WINDOW SILL FORM in place. After pour of concrete form is readily moved and used again on next window. Cone holes in wall have not yet been filled.



10 WALL FORMS for first story are in place at second-floor line. Ribbed panels will be covered with lintel covers so as to form tie beam. Concrete lift from lintel line is poured simultaneously with second floor slab.



11 REINFORCING STEEL and electrical conduits in place for second-floor slab. Note top of form for load bearing partitions and curbing around openings.



12 INTERIOR DETAIL, showing handling of door and window openings. Insulation board, serving as plaster base, is fastened to nailing strips in wall ribs.

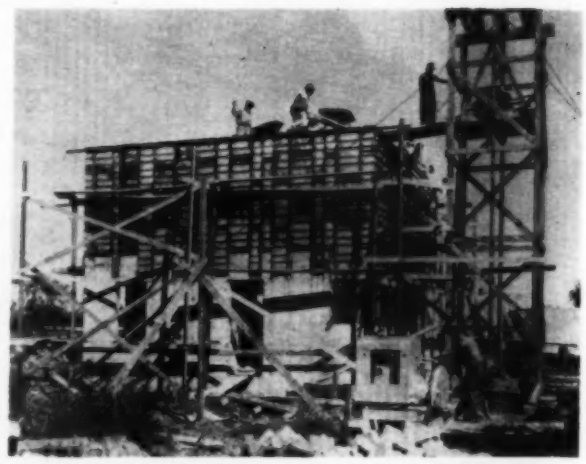
13 CHIMNEY HEAD *(below)* covered by ornamental cap at roof peak, serves as outlet for all vents in house.

mum size aggregate, was used. The walls consisted of a 6-bag mix, approximately 1:2½:3, using ½-in. maximum size aggregate.

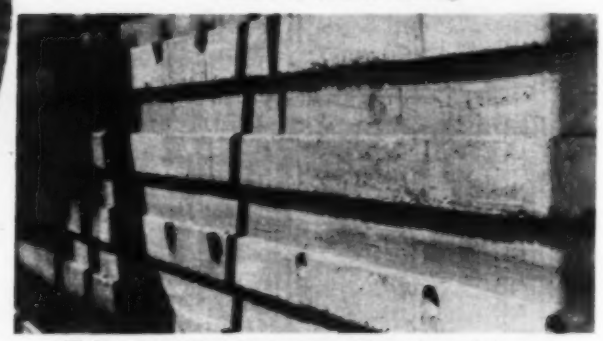
For the outside walls the steel panel forms for the exterior surface were assembled to full height and the inside forms were placed in successive lifts as concrete pouring progressed. Reinforcement was placed full story height. Concrete was poured in three lifts, the first from floor line to window sill (following which window bucks were installed); the second from sill to lintel; and the third from lintel to and including the next floor slab.

The accompanying photographs indicate the successive construction steps in building the Lone Star Home.

17 COMPLETED HOUSE *(below)* showing how space over garage has been utilized as sun deck. Rounded corner of garage wall required plywood form in conjunction with steel panel forms.



14 CONCRETING in progress at third slab level. Forms have been stripped from first story and re-used on second story. Note absence of outside bracing.



15 HORIZONTAL GROOVES, formed by attaching wooden strips inside steel forms with screws, relieve front facade.

16 SPIRAL STAIRWAY o monolithic concrete, cantilevered from wall to leave clear space beneath, is feature of entry hall.

PORTABLE TENT

Protects Winter Bridge Jobs

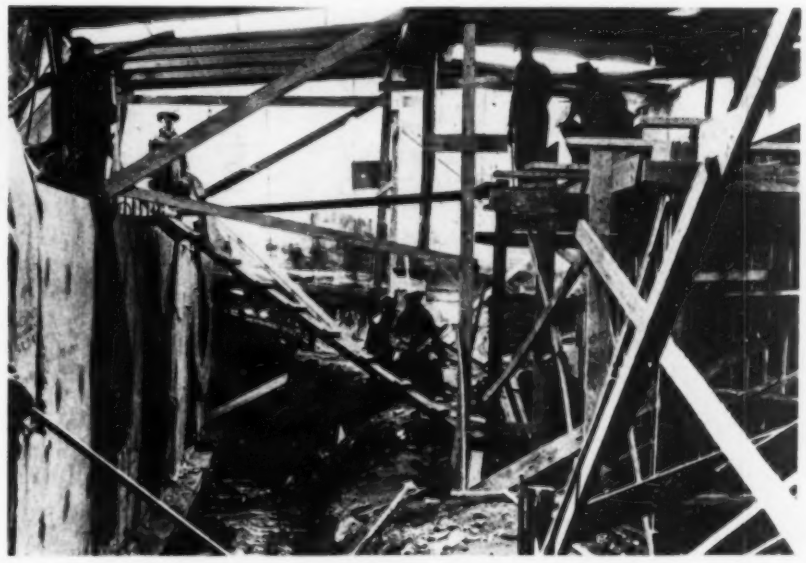
PORTABLE HOUSING made up of canvas-covered panels on timber frames incloses one of series of four small concrete bridges built during winter by Ohio contractor.

A SECTIONAL canvas inclosure made up in panels for ready dismantling and erection aided W. P. Townsend, of Greenville, Ohio, last winter in building four reinforced flat-slab bridges requiring 675 cu. yd. of concrete on an Ohio highway. Construction of the four bridges, which had 20-ft. clear spans and clear roadway widths of 30 ft., was begun on Nov. 15 and completed about Feb. 15, more than 4 months ahead of the date set by the contract. The housing to inclose these structures was made 32 ft. wide and 80 ft. long to afford storage space for a supply of lumber at one end. Work progressed uninterruptedly inside the housing 7 days each week and at night, when necessary, with only one day's shutdown because of severe weather.

The portable panels consisted of 14½x16-ft. tarpaulins stretched on wood frames with intermediate supports at 4-ft. intervals. Two stoves inside the inclosure and a traction boiler outside supplied heat and steam sufficient to maintain a constant temperature between 70 and 120 deg. F. until all the concrete had been placed and cured. Translucent cloth skylights supplemented by electric lamps provided illumination inside the tent. The inclosure gave a working clearance of 6 ft. above the roadway at both ends, with a pitch of 18 in. from the center to assure proper drainage.

At each site the tent was erected over a solid framework of 2x4-in. timbers after excavation for the footings and abutments had been completed. It was left in place until curing of the concrete was completed, when the sections were taken down and moved up the road to the next bridge site.

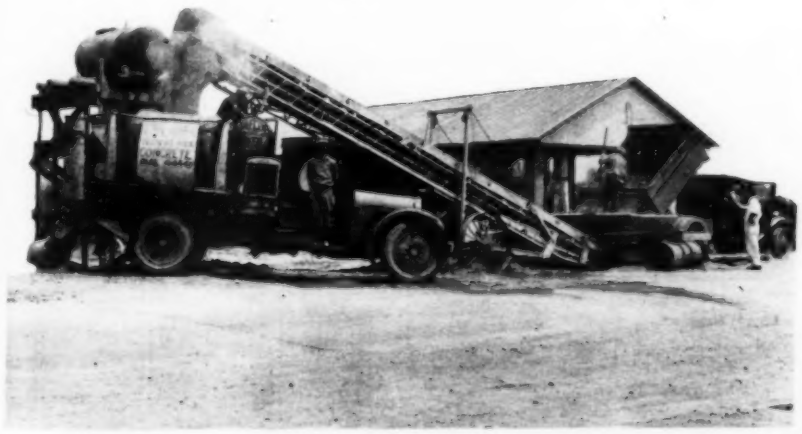
Mr. Townsend directed a crew of 30 men in building the four bridges. The work was performed under the supervision of H. C. Miller, division engineer, State Department of Highways, Sidney, Ohio. Robert Stoltz, of Greenville, was resident engineer.



AMPLE LIGHT AND WORKING SPACE are provided by large portable tent equipped with translucent cloth skylights and electric lamps.

TRUCK-MIXERS

Widen Virginia Pavement



TRANSFER PLANT of R. K. Williams, Inc., loads aggregates, cement and water into three 2½-yd. truck mixers, which distribute concrete from this set-up for widening base on 2.7-mi. at east end of 4.2-mi. contract. Dump truck deposits properly proportioned batch of sand and gravel in hopper at foot of belt conveyor.

TWO VIRGINIA CONTRACTORS, Boxley Bros. Co., Inc., of Orange, and R. K. Williams, Inc., of Richmond, utilized truck-mixers charged by portable transfer plants to widen existing concrete pavement or concrete base in 1934. The first-named contractor employed two set-ups of a transfer plant incorporating a Barber-Greene belt conveyor to load three Blaw-Knox 2-yd. truck-mixers in building 6 mi. of 11-ft. widening on U. S. 1, south of Fredericksburg. A similar transfer plant served three Jaeger 2½-yd. truck-mixers operated by the Williams organization in widening two sides of U. S. 60 at Sandston, Va., with a 7-in. concrete base to be covered with cold-laid asphaltic material corresponding to the surface of the existing pavement. The widening strips at the two edges of the pavement ranged from 6 to 11 ft. in width. About 2.7 mi. at the east end of the contract was served by the transfer plant. The remaining 1.5 mi. was built by the truck-mixers with material hauled from a permanent plant in Richmond. Both contractors used steel forms for the outside edge. Pavement on U. S. 1 was struck off by machine and base on U. S. 60 by hand templet.

TRUCK MIXER delivers concrete to subgrade on Boxley Bros. contract after turning mixture over in drum for 4 min. Timber blocks and sled carry one dual rear wheel across steel rail and wood form to position for dumping. Steel rail, at left, is for finishing machine. Wood form raises new slab 4½ in. above existing pavement at this point as first step in superelevating curve. Combination concrete and asphalt cap on adjacent 9-ft. lane of old 18-ft. crowned pavement will correct faulty banking and provide uniform slope from outer edge to inner edge of 29-ft. width of curved roadway.

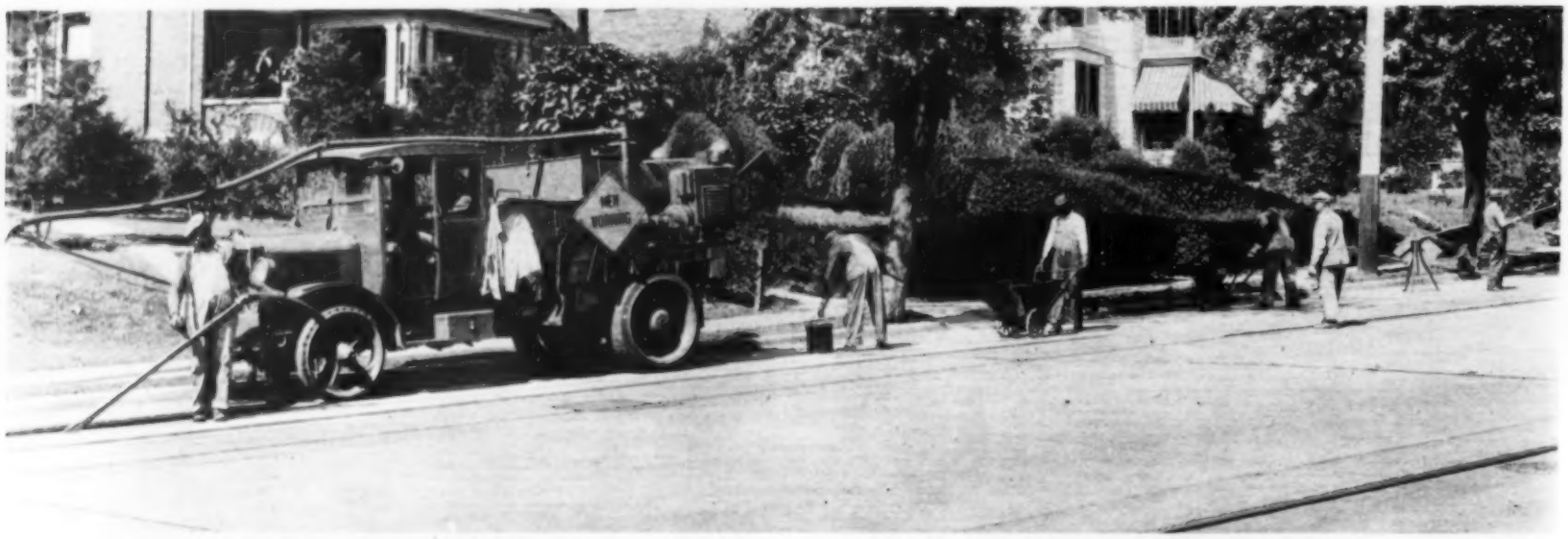
STREET MAINTENANCE

Cincinnati's Methods and Equipment Illustrated by Photos From

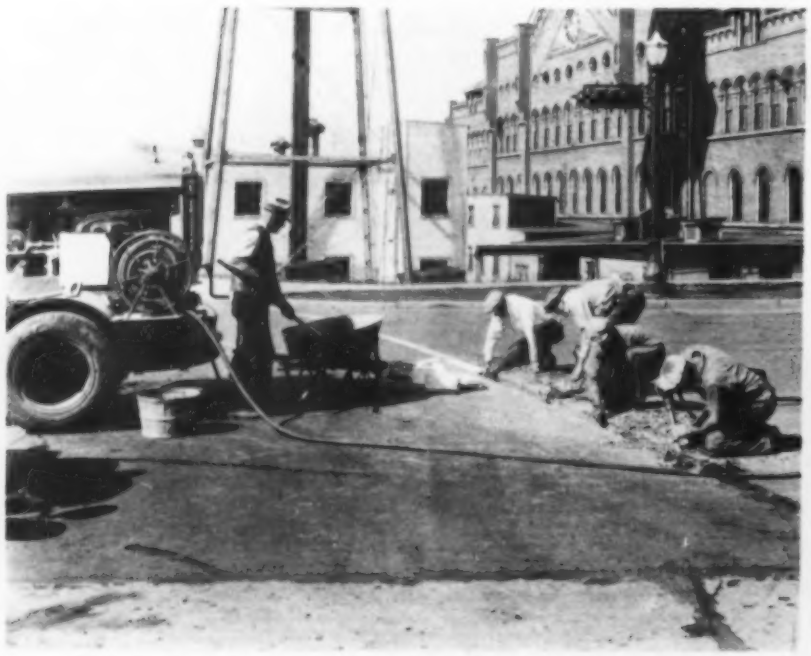
C. E. BROKAW

Superintendent, Highway Maintenance, Cincinnati, Ohio

HIGH SPOTS in concrete pavement, such as may occur at expansion joints, are cut down by this portable gasoline-driven grinder.

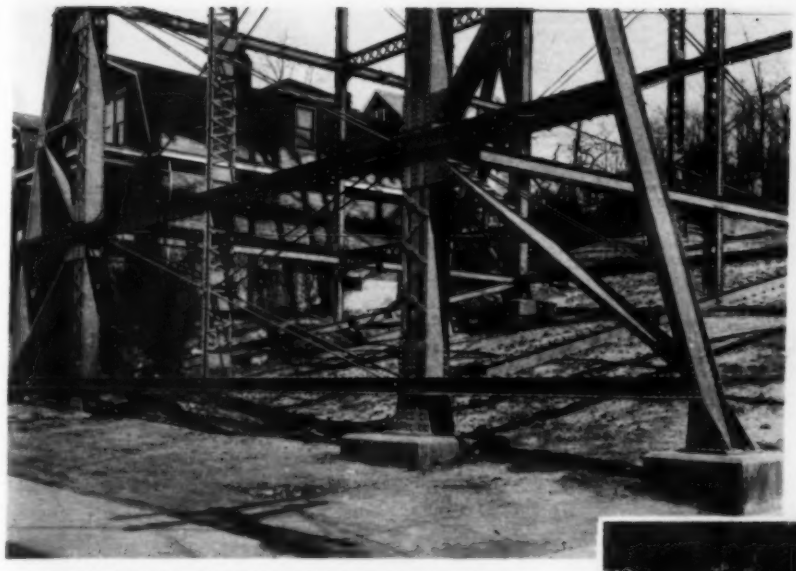


FILLING CRACKS in concrete paved streets is done with equipment consisting of blower, sand box and asphalt tank mounted on truck. Air hose cleans crack prior to filling with asphalt from two-wheel buggies, fitted with a sand and an asphalt compartment. Manually controlled orifices in tank bottom control flow of asphalt and sand.

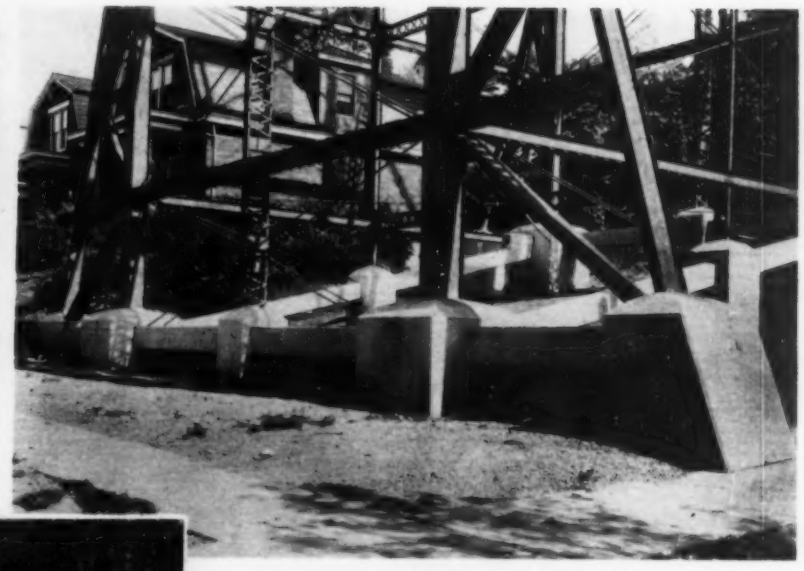


PRECAST MARKERS, made of white limestone chips, white sand and white cement, are installed on Portland cement grout bed. Air-operated chipping hammer dresses sides of cut. Dimensions of precast markers are 6x2x12 in.

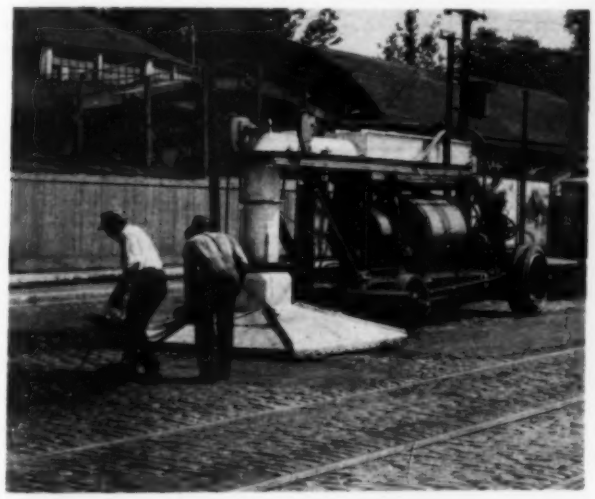
CAST-IN-PLACE MARKERS form white guide lines in asphalt pavement for guidance of traffic and of pedestrians at cross-walks. Mix consists of white limestone chips, white silica sand and white cement.



REPAIRS TO COLUMN BASES and lateral braces of steel viaduct, were necessitated by rusting caused by splashing from passing traffic.



CONCRETE ENCASEMENT of steel viaduct members was method employed to halt deterioration and prolong life of structure.



SUPERHEATER removes excess asphalt filler from granite block pavement prior to resurfacing with sheet asphalt.

PAINTED TRAFFIC LINES are applied by machine equipped with gasoline-driven air compressor for spraying paint through atomizer. Pair of adjustable circular disks regulate width of paint coverage between limits of 3 and 8 in.

SANDING and SALTING to decrease slipperiness of paved surfaces during winter is done by spreader behind truck. Mixture of sand and salt is preferred to cinders.

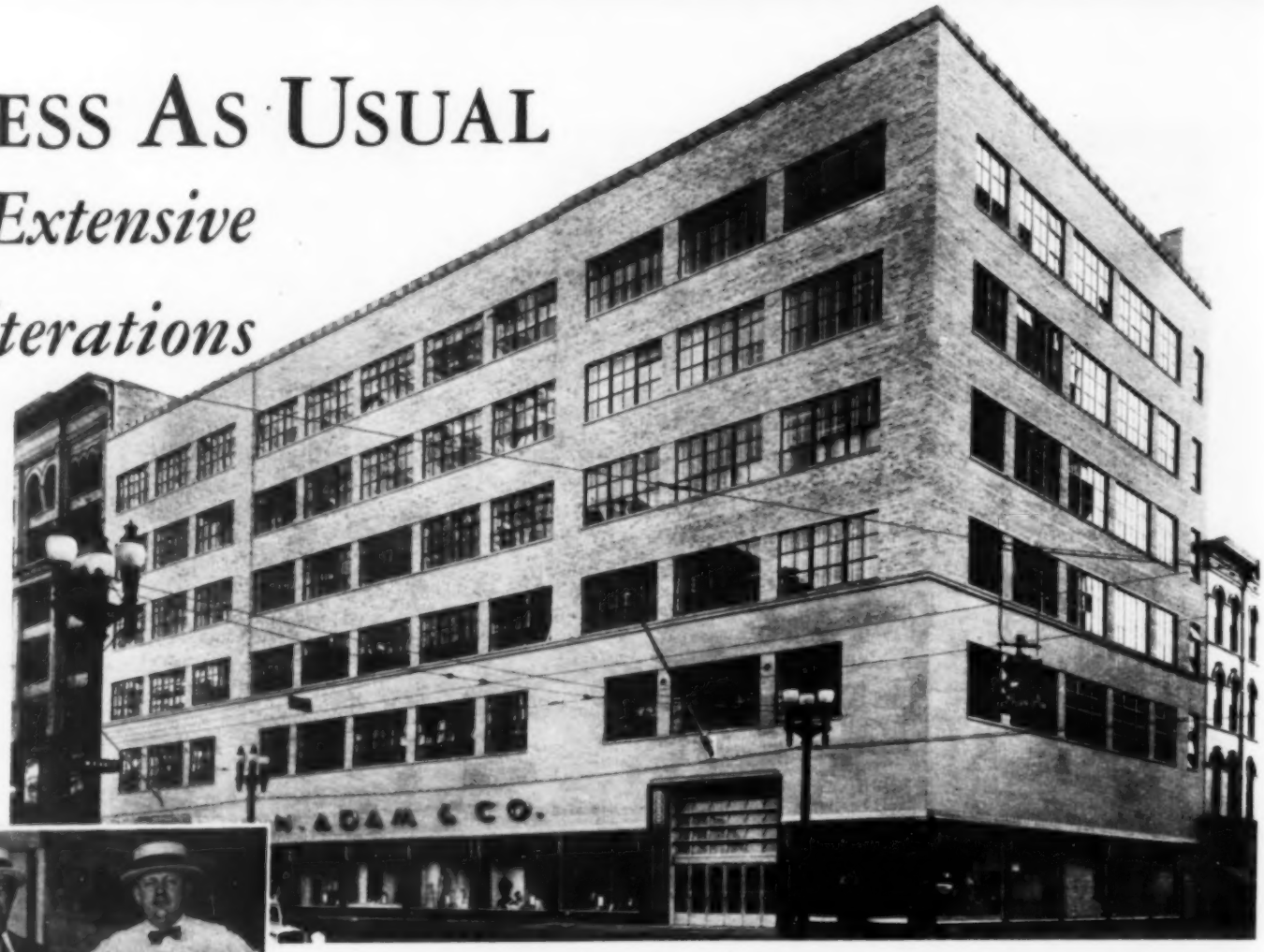
LOADING PLATFORM BUMPER receives coat of white enamel, sprayed on by "gun" fed with air from compressor on trailer drawn by truck.

SKIMMER SCOOP on ½-yd. power shovel removes old wood block pavement prior to resurfacing street with asphaltic mix

"WASHBOARD" CORRUGATIONS *(left)* on macadam streets are planed off with tractor-hauled disk planer, followed by blade grader which spreads material and fills depressions. Excess material removed by truck at rear.

BUSINESS AS USUAL

During Extensive Store Alterations



SIX MONTHS WORK and $500,000 investment transform heterogeneous group of old buildings *(right)* into modern integrated unit designed for efficient department store operation and good appearance.

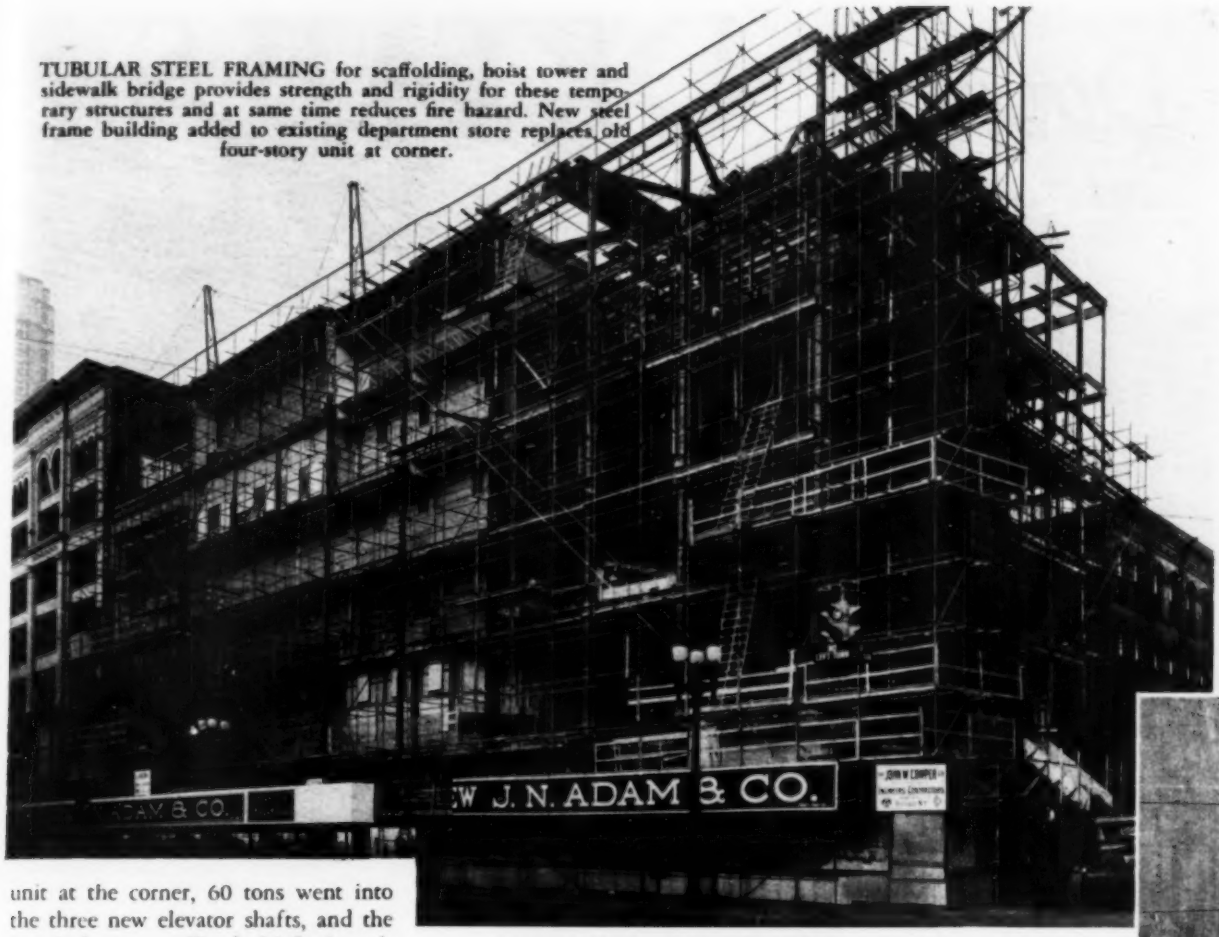
MODERNIZATION is carried out under direction of these men *(left)*: (Left to right) H. L. Rickloff, superintendent; John W. Cowper, president; and D. B. Neiderlander, general superintendent, John W. Cowper Co.

IN A PERIOD of less than 6 months between receipt of the first working drawings and completion of a $500,000 remodeling operation in the J. N. Adam & Co.'s department store, Buffalo, N. Y., the John W. Cowper Co., of Buffalo, removed an old brick party wall inside the store, replaced three hydraulic plunger-type elevators with automatic modern units, built a 55x85-ft. steel-frame structure six stories high in one corner of the existing building and reconstructed the face of the entire Main St. frontage—all without retarding or diminishing in any way the normal flow of store business. Attractive temporary inclosures concealing interior operations, a spacious sidewalk bridge covering store entrances and wood-sheathed temporary show windows invited customers into the store and hid all unsightliness from their view. Noisy demolition work inside the store was carried on principally at night. Pneumatic-tired wheelbarrows eliminated objectionable noise from building operations carried on behind the temporary partitions during the day. Tubular steel framing for the sidewalk bridge, scaffolding and hoist tower reduced the fire hazard to a minimum and improved the safety of working conditions both for the public and for the contractor's employees.

Building Alterations — During a long period of business growth, J. N. Adam & Co. took over and combined into a single department-store unit four adjoining buildings, with brick party walls between them, running through from Main St. to Washington St. Several years ago the architects and the contractor engaged in the present work took out two party walls in the lower floors of the store and installed steel columns which were designed to be extended upward at some future date when the remaining portions of the two party walls may be removed. As part of the present remodeling, the contractor removed the entire third party wall and another similar wall about 100 ft. long adjoining the new steel-frame structure erected at the corner of Main and Eagle Sts.

Erection of about 400 tons of structural steel was involved in the improvement. Of this amount, 275 tons went into the steel frame of the rebuilt

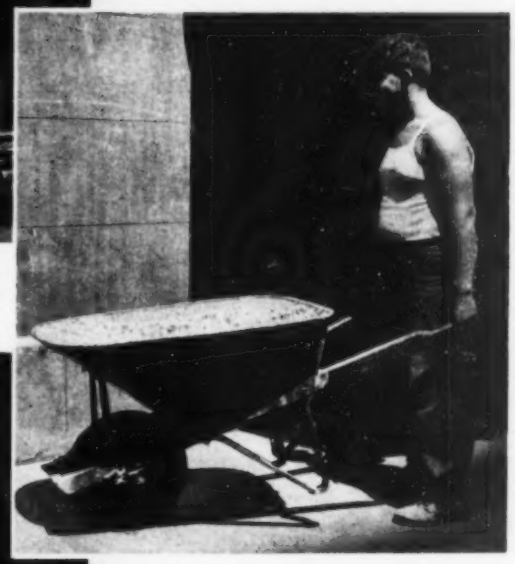
BEFORE TAKING short course in modernization, Buffalo street corner presents group of buildings of various sizes, ages and architectural styles. Old J. N. Adam & Co. frontage, at left, comprises several clashing facades. Compare this disorder with unified appearance of modernized exterior at top of page.



TUBULAR STEEL FRAMING for scaffolding, hoist tower and sidewalk bridge provides strength and rigidity for these temporary structures and at same time reduces fire hazard. New steel frame building added to existing department store replaces old four-story unit at corner.

unit at the corner, 60 tons went into the three new elevator shafts, and the remainder was utilized chiefly in columns and spandrel beams for the improved Main St. front of the three old six-story buildings. The new columns of the Main St. front are spaced at advantageous intervals for show windows. Before installing these columns and the spandrel beams, the contractor removed the entire face of the three old buildings, including steel and cast-iron columns and brick piers.

Interior partitions concealing construction work consisted of composition wallboard on 2x4-in. studs. Many of these partitions were covered with canvas on which the store's advertising department painted murals depicting the improvements being made in the building. An accompanying photograph indicates the finished character of the temporary work under the sidewalk bridge. Both the exterior inclosure and the interior lining of the temporary



PNEUMATIC-TIRED WHEELBARROWS *(right and below)* facilitate quiet delivery of materials behind temporary partitions inside department store during day. Noisy interior operations are performed principally at night.

WOOD - SHEATHED AND PAINTED sidewalk bridge and temporary show windows maintain attractiveness of street frontage and continue to invite customers to enter store during modernization.

show windows consisted of 2½-in. tongue-and-groove sheathing faced on one side. Other photographs accompanying these notes show the tubular steel scaffold and hoist tower and the pneumatic-tired wheelbarrows, twelve of which were used for transporting building materials inside the store.

Architectural Features — Facing of the remodeled store for the entire Main St. front, 185 ft. long, and for 85 ft. on Eagle St. called for a base of Wisconsin black granite, imported blue pearl granite on the show window piers, Kasota stone for the second and third floors, and hard-pressed Pennsylvania brick in standard and large sizes above the third floor. The main merchandising floor and the executive offices, were sound-proofed, and provision was made for future air-conditioning of the entire store. The architects made extensive use of indirect lighting and cove lighting both for the show windows and for the interior of the building.

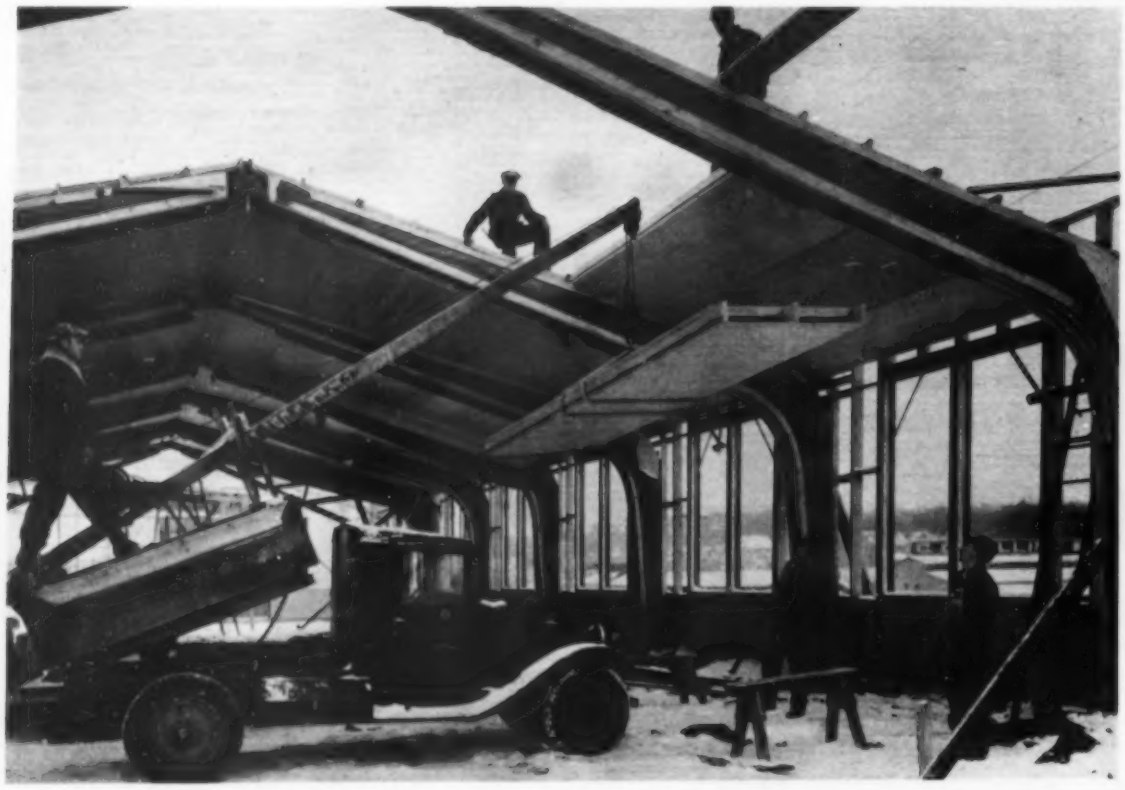
Replacing the three outmoded elevators are three self-leveling electric elevators, equipped with electrically-driven self-closing doors controlled by photo-electric cells. Ramps 75 ft. long were constructed at three levels to connect floors of the new building with an old service building at the corner of Washington and Eagle Sts.

Progress—Preparation of working drawings was started in the New York City office of Starrett & Van Vleck, the architects, on April 1, 1935. The alterations were complete, and the remodeled portions of the store were in full use, on Oct. 1, 1935. A time interval of precisely 6 months sufficed to carry through the entire project from inception to completion.

Direction—J. N. Adam & Co. is a unit of the Associated Dry Goods group. Under the supervision of Starrett & Van Vleck, of New York City, the architects, the entire contract including the remodeling was executed by the John W. Cowper Co., of Buffalo,— John W. Cowper, president; D. B. Niederlander, general superintendent; and H. L. Rickloff, superintendent.

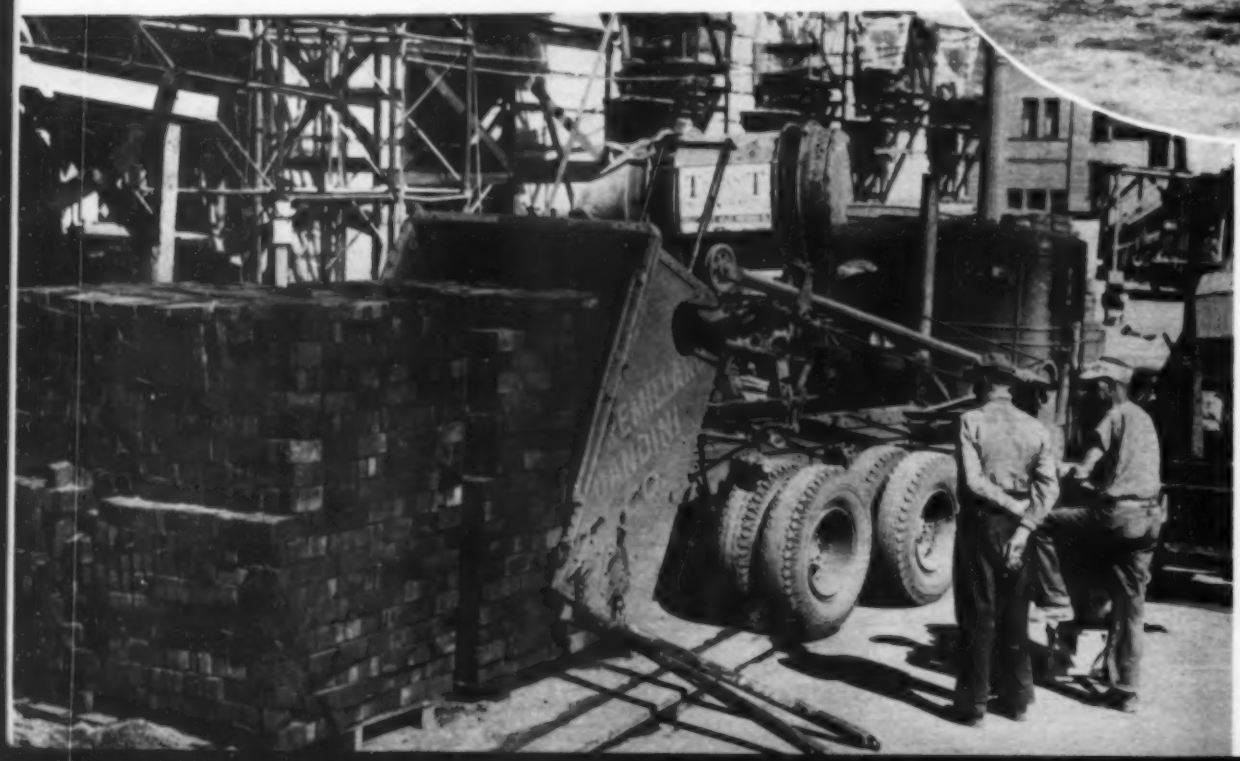
Getting Down to DETAILS

{Close-up Shots of Job Methods and Equipment}

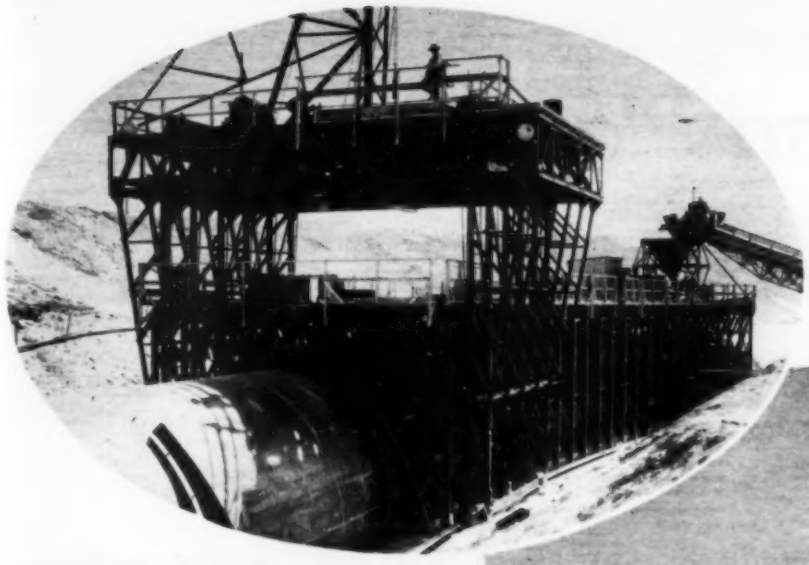


BODY-MOUNTED BOOM HOIST on end-dump truck erects built-up plywood roof panels on service building of U. S. Forest Products Laboratory, Madison, Wis. Each panel, forming large flat box beam, consists of upper and lower sheet of Douglas fir plywood 4 ft. wide and 16 ft. long glued to three 2x6-in. joists, one at each end and one in the middle. Upper sheet, five-ply and 5/8-in. thick, forms roof sheathing, and lower sheet, three-ply and 3/8 in. thick, provides smooth ceiling. Tests demonstrate that these units, because of stress value of plywood, have strength and stiffness equal to ordinary decking supported by 10-in. joists. Included in each panel is insulating blanket fastened at mid-height of joists. Plywood in roof, as well as in walls, is built up with commercial moisture-resistant glue. Six men and hoist erect nine large prefabricated arches of laminated glued wood construction in 1¼ days and place roof panels over 8,900 sq. ft. of floor area in 2 days. Roof is covered with tar and gravel. Wood sash for windows set in plywood wall occupy half of perimeter of building. Although construction required pioneering expense in arch fabrication, cost of $23,000, or 15½ c. per cubic foot, compares favorably with cost of ordinary construction.

COMMON ROCK SALT to preserve binding quality of clay and maintain dustless surface on stabilized clay-gravel road is applied with ordinary farm limestone spreader on project for Illinois Division of Highways by E. R. Kelly, contractor, of Mattoon, Ill. After two 2-in. layers of stabilized material have been placed and compacted, spreader scatters rock salt at rate of about 12 tons per mile of 18-ft. width before final 2-in. layer of total 6-in. thickness is applied.

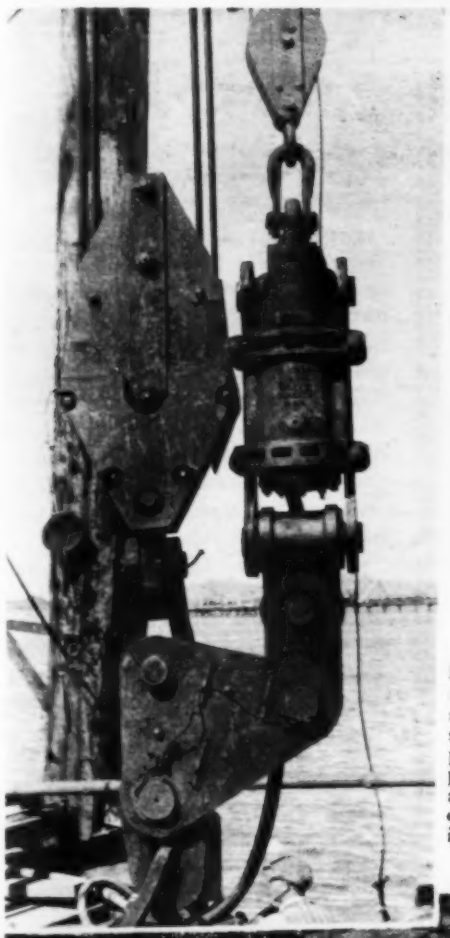


ECONOMICAL BRICK-HANDLING from kiln to job is facilitated by truck and trailer equipment developed and patented by Remillard-Dandini Co., brick manufacturer, of Oakland, Calif. Diesel-powered truck is equipped with special hoist for loading and unloading *(left)* steel boxes containing tiers of bricks as stacked on wooden platforms at kiln. When loading, truck hoist first places two boxes on trailer, one at a time, and finally draws third box up on to truck chassis. Three boxes, containing 7,000 or 8,000 brick, ride to job on pneumatic tires *(in oval, above)*. At building site, after trailer is unhitched, truck first deposits box from chassis and then picks up and spots boxes from trailer, as shown at left. Steel bars slipped under wooden platform are locked across open end of steel box when loading and are unlocked and removed after platform has been placed on ground at site.

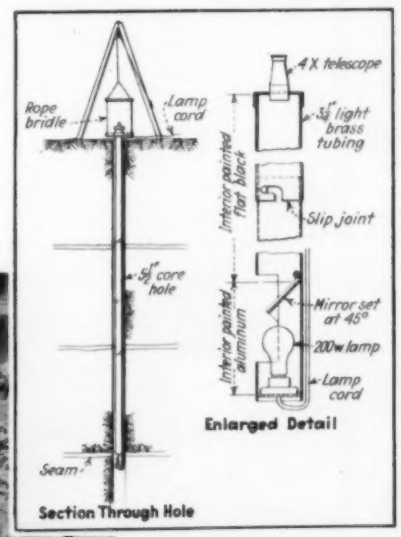


CONDUIT CONCRETING *(below and at left)* by Barrett, Hilp & Macco Corp. on Colorado River aqueduct being built by Metropolitan Water District of Southern California employs side-discharge truck mixers feeding belt conveyor which delivers to deck hopper on top of steel forms. Gasoline-powered hopper car transports concrete from this point to openings in forms. Structural steel gantry *(in oval)* lifts 35-ft. form sections weighing about 30 tons each with screw jacks driven by 150-hp. gasoline motor which also furnishes power for locomotion on steel rails. Stiff-leg derrick on gantry spots materials.

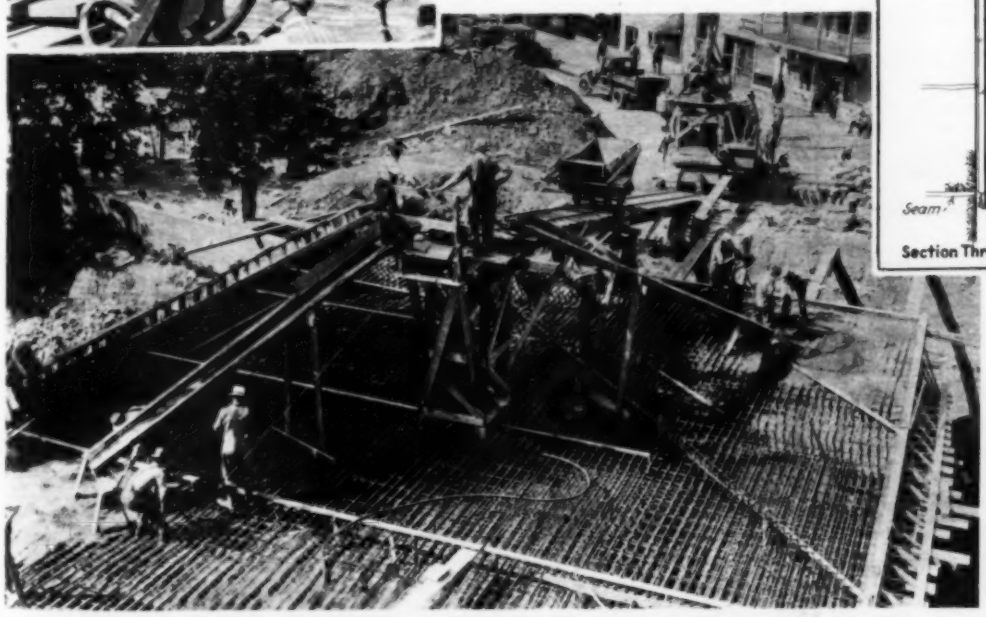
Photos, Inman



STEAM-DRIVEN PILE EXTRACTOR *(left)* of 25-ton capacity suspended on separate five-part line and coupled by offset plate to lower block of main sixteen-part lifting tackle (designed for 125-ton pull) is used by Bridge Builders, Inc., to assist in jarring loose steel sheet cofferdam piles around piers of East Bay crossing of San Francisco-Oakland bridge.



FOUNDATION INSPECTION by means of periscope *(above and at right)* developed at Norris dam aids TVA engineers in determining results of grouting. Brass tubing in 10-ft. sections is easily assembled in lengths up to 40 ft. Suspended from portable A-frame, periscope can be revolved at any depth.



INCLINED TRACK carries special hopper car delivering concrete to chutes on Tekamah rigid-frame bridge, being built by Nebraska Department of Roads and Irrigation on U. S. Highway No. 73. Car is pulled up incline by team hitched to hauling line. *Photo from* M. B. JONES, *paving engineer.*

FOURTH OF A SERIES OF ARTICLES

Planning and Plant for

HEAVY CONSTRUCTION

Principles and Practices of Job Layout and Selection and Use of Equipment for Large Dams and Appurtenant Works

By ADOLPH J. ACKERMAN *and* CHARLES H. LOCHER
Construction Plant Engineer *Construction Consultant*
TENNESSEE VALLEY AUTHORITY, KNOXVILLE, TENN.

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Construction Plant Layout—Equipment Schedules

IN THIS CHAPTER we shall get down to the main features of a heavy construction project, dealing in particular with the planning of overall construction operations and the preparation of all essential schedules. It must first of all be assumed that the construction planner has a comprehensive knowledge of how to handle rivers during construction and has thoroughly familiarized himself with all of the physical and related conditions surrounding the project. A representative list of such conditions is shown in Table 1. Incidentally, this table is of equal importance to those engaged in preliminary studies, as discussed in Chapter 1 (see *Construction Methods*, November, 1935).

The general problems of planning the major construction operations are most readily understood by reviewing a specific case such as the Pickwick Landing lock and dam of the Tennessee Valley Authority. With the introduction of numerous exhibits from that project this chapter is set up more or less as an illustrated discussion.

Breaking Project into Stages—Fig. 1 is a general plan of the project. The excavation of more than 1,000,000 cu. yd. of earth and gravel on the south bank of the river is used to build the 1-mi. long earth dam on the south bank. The area thus excavated provides space for the navigation lock. The spillway, occupying the full width of the river because of its high flood capacity, is a concrete structure throughout, with large steel regulating gates. The intake for the future power house is located entirely within the north bank of the river. Here again more than 1,500,000 cu.yd. of earth must be excavated to form a tailrace and forebay for the power house and incidentally a diversion channel during construction. This earth is to be moved to the north bank to form an elevated area above high-water levels for an outdoor switching station.

TABLE I

CHECK LIST FOR THE CONSTRUCTION PLANNER

TOPOGRAPHY

Camp Location	Spoil Areas
Plant Layout	Anchorages
Storage Areas	Drainage

GEOLOGY

Overburden	Rock
Subsoil	Stratification
Groundwater	Faults
Springs	Physical Character
Caves	Solution Channels

CLIMATE

Temperature	Ice
Seasons	Storms
Rainfall	Tornadoes
Snow	Earthquakes
Mud	Dust

RIVER STAGES

Normal Flow	Rating Curves
Low Water	Backwater
Floods	Stage Predictions

PROPERTY

Adjacent Owners	Ribarian Rights
Boundaries	Mineral Rights
Access	Timber Rights
Purchase	Dumping Rights
Rentals	Sanitary Rights
Easements	Fire Hazards

SHIPPING FACILITIES

Rail & Highway	Waterway
Tunnels	Locks
Bridges	Draft
Curves	Speed
Tariffs & Fees	Return Load
Transfers	Docks
Terminals	Loading & Unload'g

POWER & FUEL

Kinds	Transmission
Sources	Portable Plants
Characteristics	Central Plants
Capacities	Water Supply
Rates	Storage

HOUSING FACILITIES

Nearest Town	Hospital
Camp	Schools
Sanitation	Fire & Police
Food Supply	Gardens

LABOR

Regulations	Seasons:
Wage Scales	Variations
Compensation Ins.	Local & Imported
Availability	Skilled & Unskilled
Water Supply	Race & Color

PUBLIC RELATIONS

Owners Policies	Local Purchases
Political Structure	Visitors
Local Contracts	Public Liability

COORDINATION OF DESIGN

Possible Changes	Sequence of Work
Undefined Work	Heavy Installations
Extra Work	Inspection

LOCAL CONDITIONS

There may be dozens of local conditions which the planner must consider, and this check list cannot be accepted as a complete guide.

Original Plan—Fig. 2 is interesting because it shows the first idea on an arrangement of cellular cofferdams which cuts the job into four separate stages, but this idea was later abandoned in favor of a better one. It was originally planned first to construct the lock and at the same time carry on operations in the power-house area on the other side of the river. Next, the third stage was to be built while the river passed through the area represented by stage No. 4, as well as through the completed power-house intakes. As the final stage, No. 4 was to be constructed with the river passing through openings in the completed structures.

Final Plan—In laying out the first scheme of cofferdams it was estimated that 2½ yr. would be required to build the project. However, after carefully studying river conditions and hydrographs and making various estimates of cost on this and alternate schemes, it was decided to adopt the layout shown in Fig. 3. This layout now consists of only three stages, and important economies were introduced by arranging to use the sheet piling three times by first constructing the lock, then dismantling the cofferdam and re-erecting it for stage No. 2, and finally repeating this operation for stage No. 3. This procedure also resulted in a more efficient use of all construction equipment, although the period of construction was extended to 3 yr., with a corresponding increase in overhead and other incidental expenses.

Construction Schedule—Fig. 4 is a sort of "backbone" construction schedule which helps to amplify the reasoning developed in the layout of the three stages of construction. Representative hydrographs of the Tennessee River are shown at the bottom and indicated the high flood season which occurs in the spring of each year. The construction of the 55-ft. high cellular cofferdams, being rather hazardous and expensive operations, are scheduled during the most favorable low-water stages. Between these focal operations the concreting program and excavating program are scheduled to tie into the entire operation in the most economical manner. It will be noted that one of the major operations, the removal of approximately 3,000,000 cu.yd. of earth and gravel, will be done by dredging and, as indicated in the schedules, this operation is permitted to continue without interruption for about 2 yr. Concreting operations, however, are scheduled to be interrupted after the first and second stages. While it is in general very desirable to avoid such interruptions, the present arrangements were found to be more economical. In passing, it should be stated that in preparing such a program the planner must have a general conception of suitable equipment and its daily and monthly performance capacities in order to establish the proper timing for the various operations.

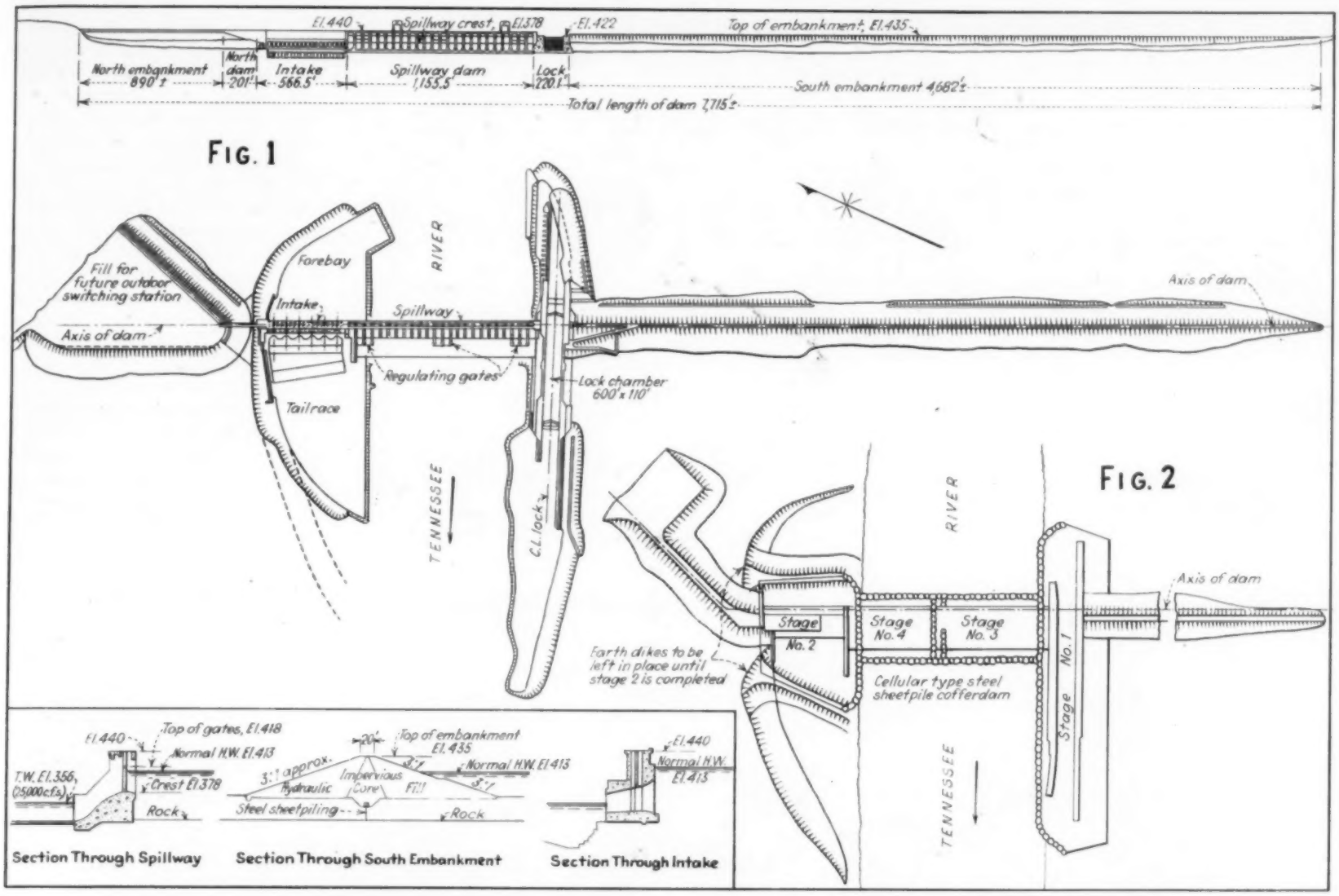


Fig. 1 . . . GENERAL PLAN of Pickwick Landing dam, showing main elements of structure on Tennessee River.

Fig. 2 . . . FIRST STUDY of cellular cofferdams in four stages, later revised as indicated in Fig. 3.

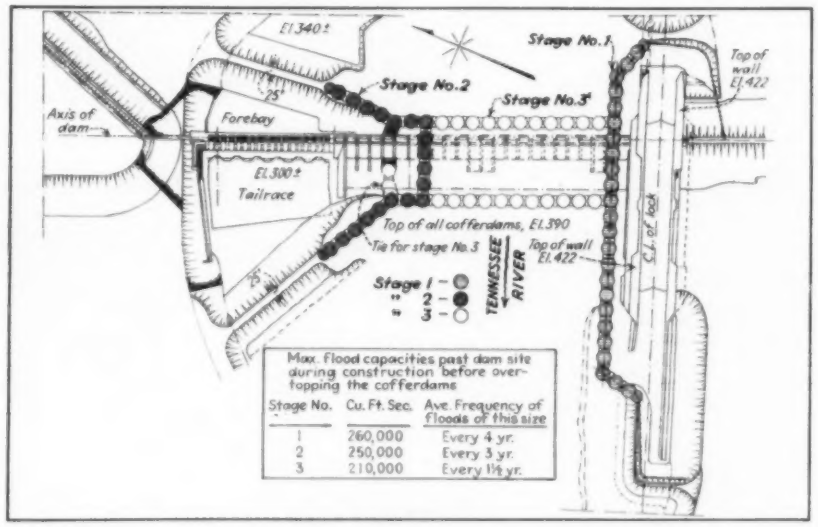

El. 340±
Stage No. 1
Top of wall El. 422
Stage No. 2
Stage No. 3
Axis of dam
Forebay
El. 300±
Tailrace
Top of all cofferdams, El. 390
Tie for stage No. 3
Top of wall El. 422
C.L. of lock
Stage 1 –
" 2 –
" 3 –
TENNESSEE RIVER
Max. flood capacities past dam site during construction before overtopping the cofferdams
Stage No. | Cu. Ft. Sec. | Ave. Frequency of floods of this size
1 | 260,000 | Every 4 yr.
2 | 250,000 | Every 3 yr.
3 | 210,000 | Every 1½ yr.

Fig. 3 . . . FINAL LAYOUT of Pickwick Landing cofferdams, to be built in three stages.

General Plant Layout—We now come to the selection of a suitable plant layout to meet this general construction program. The first thing to be taken into account was the availability of considerable existing plant and equipment from the Wheeler dam project. The natural conclusion was that all of this equipment could simply be transferred to the Pickwick Landing dam and there placed into operation without any material modification. Part of the Wheeler plant, shown in Fig. 5, consists of a number of floating mixing plants complete with overhead gravel bins, cement silo and cranes for unloading gravel from barges into the bins. A cement barge is shown in the rear of the mixing barge and from here the cement is pumped directly into the silo. From the mixer, in the foreground, concrete is handled in buckets by the gantry crane which swings around and deposits it in the form shown at the extreme left. This plant has functioned very satisfactorily at Wheeler dam and was well suited to the local conditions, namely, slack water and a navigable depth with practically no variation in water level. By shifting the mixing plant and aggregate barges from place to place along the mile-long structure the lateral movement of concrete on land was eliminated.

Most of the Wheeler dam equipment was still in first class condition and the first studies were naturally directed toward adapting it to the Pickwick Landing project. Fig. 7 consists of reproductions of some of the rough sketches made on outline drawings of the Pickwick Landing project; only 5 such sketches are here reproduced out of a total of 14. The preparation of such sketches provides an easy means of getting a lot of ideas—good, bad and indifferent—down on paper so they can be studied in greater detail and, by a process of elimination and logical deductions, the most desirable scheme is finally selected. While in many cases such studies are not made as systematically as was done here, almost every contractor employs this principle when he goes out to look over a job and makes notations of his first impressions on the back of an envelope or other scrap of paper.

The advantages and disadvantages of each scheme are briefly indicated on the various sketches, and by studying these notes in greater detail it is possible to follow through the reasoning on how the final layout was finally arrived at. Starting with study No. 1, which shows the Wheeler dam floating equipment applied directly to the Pickwick Landing project, certain disadvantages became apparent, particularly due to the high flood stages which are encountered at this site as compared with practically no flood conditions at the Wheeler site. Double handling in the locks and other features of inaccessibility soon dictated the desirability of taking the mixing plants off the barges and erecting them at one of several different locations. These are shown in some of the subsequent studies, but there were still objections, particularly from the standpoint of possible shutdowns due to dredging of gravel from the river bottom and delivery to the dam site during the period of high floods.

Study No. 9 overcame this objection by setting up a gravel storage system of 50,000 tons capacity which would take care of at least short interruptions in the deliveries of gravel. However, this system meant a considerable increase in plant investment and further studies led to the one illustrated in study

No. 14, which shows most of the principles indicated in study No. 9 except that the storage of gravel has been increased to 250,000 tons. This idea was arrived at through the following reasoning: It was proposed to have the gravel dredged from the river bottom and delivered to the job by contract. The equipment required for this operation represents a considerable investment and it would be necessary for the contractor to charge off over a period of 3 yr. a considerable rental on his plant. Furthermore, if he geared his production to tie in with the consumption of gravel and aggregates in the construction operation, he would be able to operate his plant at full capacity only for short periods and very intermittently.

It was assumed that if the gravel dredging operations were made entirely independent of construction operations the contractor could operate his equipment at maximum efficiency and permit his bidding a lower price for the aggregates. This would, of course, result in a high rate of delivery to the job and it would be necessary to store a large volume. Since a certain amount of storage was indicated as necessary in any case, the additional investment appeared justified in view of the prospects of a lower bid price on the gravel. As it finally worked out, the contractor will be able to produce all of the necessary materials during the first low water season and he can shut down his plant during the flood season, at which time aggregates will continue to be drawn out of storage. In the following spring, the contractor can again go to work and rebuild the storage pile to full capacity before the next flood season sets in, and at that time enough aggregates will be in storage to meet construction requirements for a whole year up to the end of the job. Under this system it is expected to save about 1½ years' rental on the dredging equipment and floating plant and this saving was reflected in the bid prices subsequently received, which showed that it was more economical to purchase all of the new plants required under the scheme shown in study No. 14 rather than to employ the existing plant available from Wheeler dam, even if it were delivered to Pickwick Landing dam free of charge.

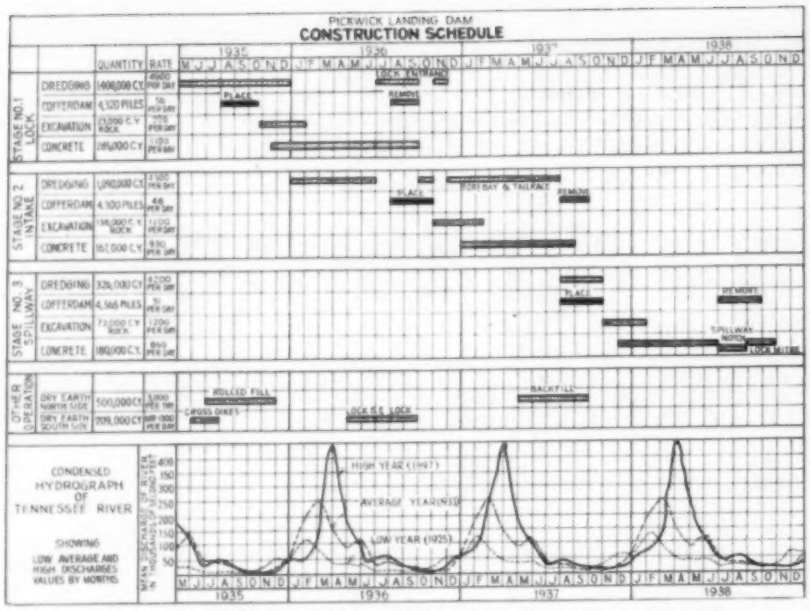


Fig. 4 . . . CONSTRUCTION SCHEDULE of Pickwick Landing dam and representative hydrographs of Tennessee River, showing flood stages.

point of this layout is that where the Wheeler equipment was at one time considered fully adaptable to the Pickwick Landing project, a thorough study of all local conditions resulted in the adoption of an entirely different layout.

It should be noted that each one of the studies on rough sketch paper was transferred to actual scale drawings so that every feature was brought out in proper relationship and, along with these, numerous studies were made of different combinations of cranes, concrete cars, concrete buckets, mixers in different sizes and combinations. The necessity of maintaining these various units in the most economical and practical relationship toward each other and to the entire plant is of course obvious and the principles governing such studies will be discussed in greater detail in succeeding chapters. The adopted layout is shown in true scale in Fig. 9.

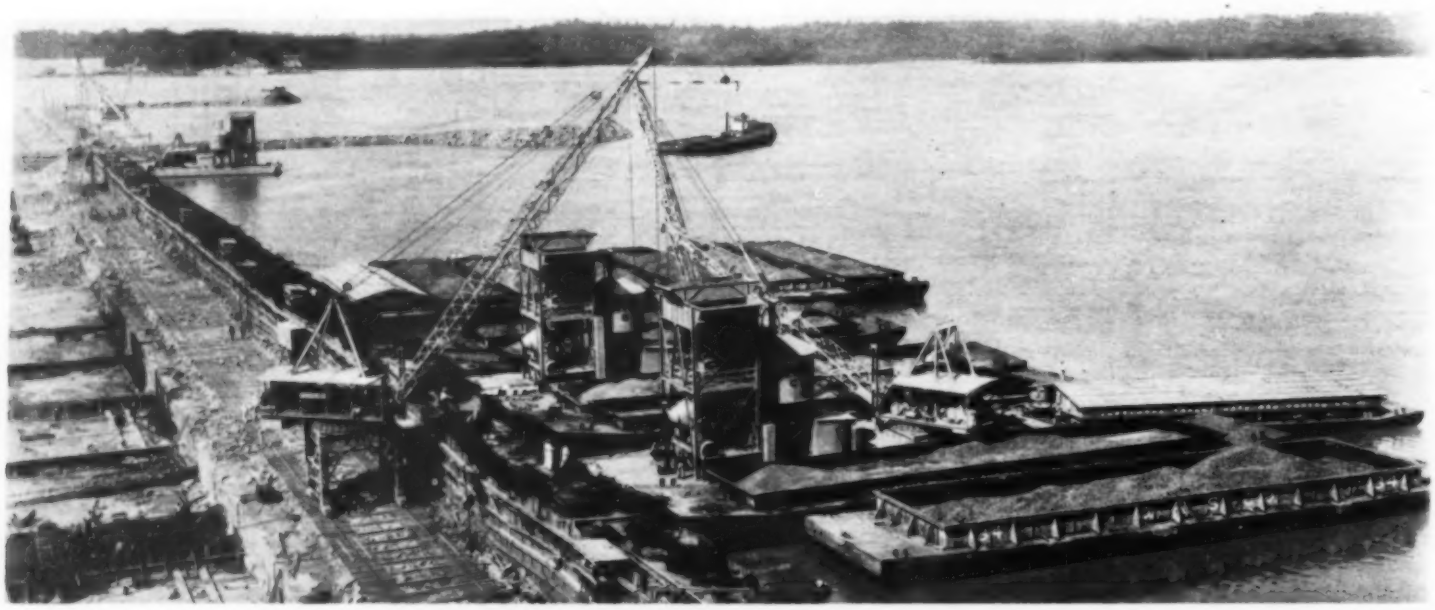


Fig. 5 . . . FLOATING CONCRETE PLANT and other equipment used to construct Wheeler dam.

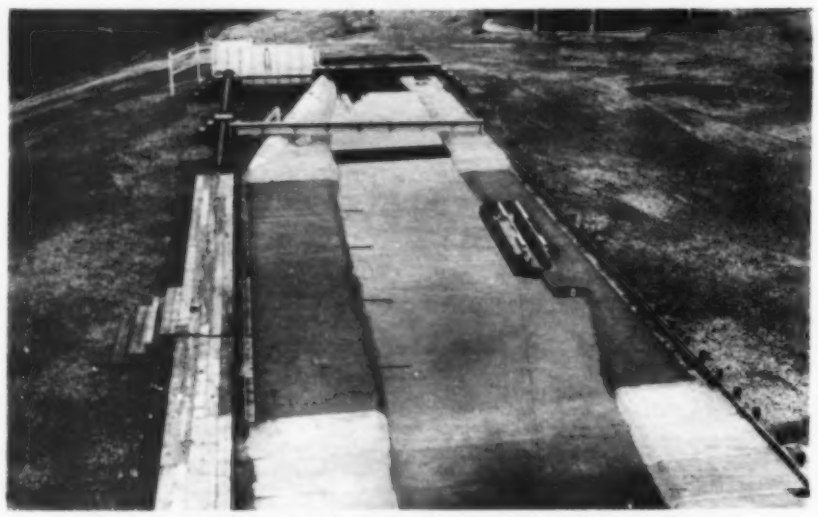
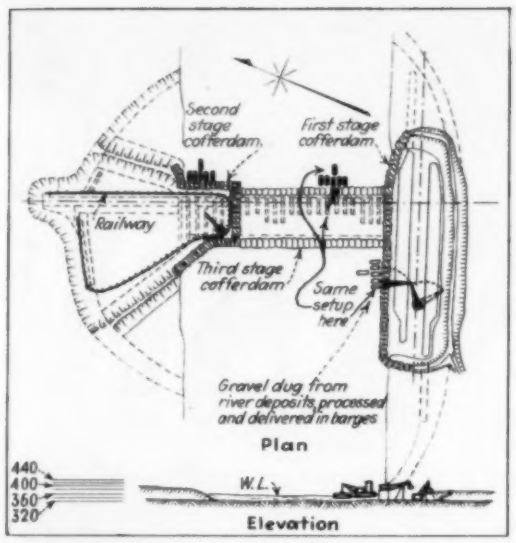


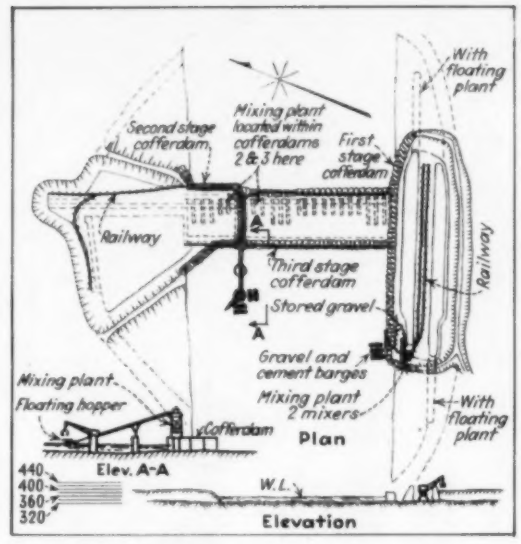
Fig. 6 . . . MODEL of Pickwick Landing dam, showing first cofferdam and completed lock, with river at normal stage.

Use of Models for Planning a Job— One of the major concerns in planning the Pickwick project was the navigability of the river at all times with major constrictions in the channel. To study this, as well as the proper layout of cofferdams and other problems, a model was built to a scale of 1 to 100 as shown in Fig. 6, and the first point to be disclosed by this model was that the site selected for the harbor for cement and aggregate barges was almost ideal, and the cross currents which were feared might exist when the river passes through the intake structure do not reach this harbor.

Safety Features — In planning the general job layout one of the most important points to keep in mind at all times is the provision of adequate walkways, stairways and similar access facilities for the workmen. Safety is the primary consideration in defining such locations. A good example of safe and adequate access facilities is illustrated in Fig. 10 which shows a covered walkway at the base of the Wheeler dam power-house intakes running to three covered stairway towers by which the

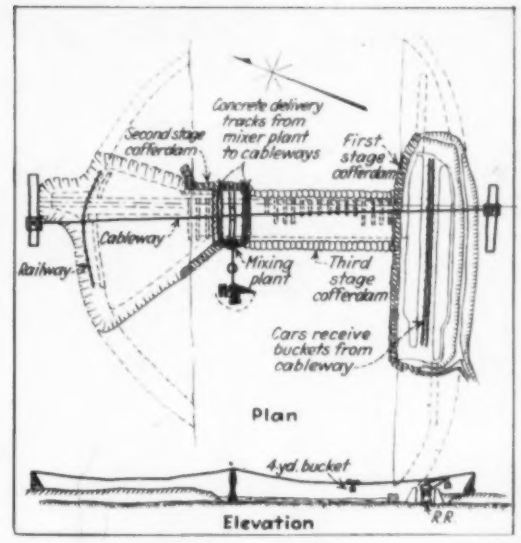


STUDY NO. 1 . . . Use Wheeler plant as is; floating mixer plants; whirler cranes on top and in cofferdams; cement and aggregates delivered in barges. *Advantages:* (1) Practically no new plant required. (2) Trained crews available from Wheeler. (3) Operations easily shifted from point to point and from stage to stage. *Disadvantages:* (1) Difficult to shift and anchor floating equipment during flood seasons. (2) 2 or 3 mixing plants required to do the job of one central plant. (3) Possible shutdowns in aggregate production due to floods.

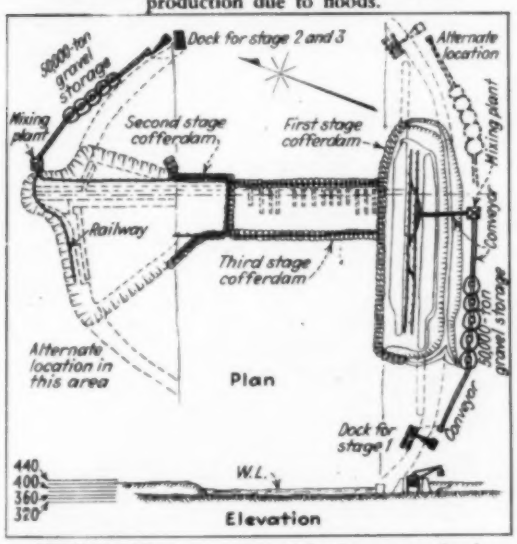


STUDY NO. 4 B . . . Dismantle Wheeler plant and rebuild into stationary plants. Build lock, then move mixer plant to serve 2nd and 3rd stages, setting on top of cofferdam to keep all equipment above flood level. *Advantages:* (1) Fixed plants. (2) Adapt existing plant. (3) 12 to 24 hours of gravel storage available. *Disadvantages:* (1) Floods interfere with navigation and gravel barge handling. (2) Possible shutdown in aggregate production due to floods. (3) Mixing plant in lock cofferdam may be inundated. (4) Dismantle and re-erect mixing plant.

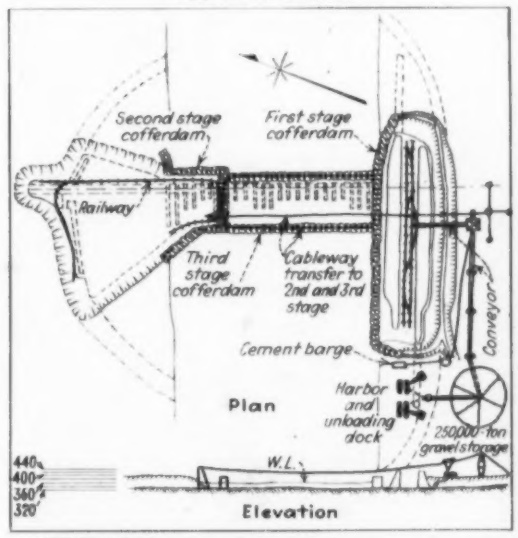
STUDY NO. 4 A . . . Same as above, but all plant on upstream side.



STUDY NO. 6 . . . Gravel by barges to fixed unloading point; one setting of mixing plant; Cableways deliver to all stages—secondary handling in lock only. *Advantages:* (1) Fixed plant. (2) Easy access and reach to all points of job. (3) One setup serves all stages. (4) Mixer plant and cableways above flood levels. *Disadvantages:* (1) Investment in cableways is high. (2) Floods interfere with navigation and barge handling. (3) Possible shutdown in aggregate production and supply due to floods.



STUDY NO. 9 . . . Gravel by barges to fixed unloading points; 50,000-ton storage for reserve; plant shifted to north side after stage No. 1 is completed. *Advantages:* (1) Fixed plants. (2) Good access to all parts of job. (3) All major plant above flood level. (4) Storage of gravel to protect against short shutdown of dredge and gravel delivery. *Disadvantages:* (1) Higher investment in plant. (2) Expense of moving all plant to north side for stages Nos. 2 and 3. (3) Separation of plant from shops, offices and camp during the 2nd and 3rd stage. Shops and camp are located on south side.



STUDY NO. 14 . . . Gravel by barges to permanent harbor; gravel production entirely independent of construction progress by building up 250,000-ton storage; fixed cableway transfer to stages Nos. 2 and 3. *Advantages:* (1) Fixed plant for all stages. (2) Good access to all parts. (3) All major plant above flood level. (4) Big gravel storage to insure continuous construction during flood seasons. (5) All plant adjacent to shops, offices and camps. (6) Lower price for gravel. *Disadvantages:* (1) Higher investment in plant. (Offset by lower price on gravel.)

Fig. 7. . . PLANT SET-UPS

covering range of 14 different schemes were studied before adopting final plan for building Pickwick Landing dam

workmen can reach the top of the structure.

Detailed Construction and Equipment Schedules — After the general plant layout has thus been fixed, it is a simple matter to expand into the variety of plant details and prepare a detailed construction schedule with full knowledge of how each operation will be handled. Such a schedule is largely an expansion of the basic operations shown in the "backbone" schedule, previously referred to. The detailed schedule may contain from 50 to 60 items; in the case of a contract job, the items thus scheduled are the bid items.

With the full construction schedule established, it is now possible to develop a simple but useful equipment schedule as shown in Fig. 8. One of the chief values of this schedule lies in the guide it offers to see that all of the equipment requirements are delivered to the job at the right time and where equipment is shifted from job to job, a reliable schedule is indispensable.

It is surprising how the time runs by when everybody is busy with plans and preparations. The job can naturally not get under way until the equipment arrives. A serious disruption of the schedule may occur if adequate allowance has not been made for the time required to select equipment, market conditions and delays in shipments, together with assembling and erection upon arrival. Most important here is the time required to "tune up" the plant and eliminate the "bugs" which do not show up until the machinery is put into operation. In a long string of interdependent operations adjustments must be made back and forth. For instance, in the setting of a crusher to develop the required size of products, modification and setting of the screen and here and there a baffle must be added and guides placed to feed materials properly from one conveyor belt

Fig. 8 . . . TYPICAL EQUIPMENT SCHEDULE serves as guide to deliveries on job at right time and in proper quantities.

PICKWICK LANDING DAM
EQUIPMENT SCHEDULE

	1935 M	J	J	A	S	O	N	D	1936 J	F	M	A	M	J	J	A	S	O	N	D	1937 J	F	M	A	M	J	J	A	S	O	N	D	1938 J	F	M	A	M	J	J	A	S	O	N	D
AUTOMOTIVE																																											
Trucks-Commercial	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Trucks-Heavy Dump		2	2	2	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Tractors and Trac-Trucks	12	12	14	14	14	14	14	14	14	14	14	14	14	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	8	8	8	8	8	8	8	6	6	6				
EXCAVATION & EQUIPMENT																																											
Drills-Core and Wagon					1	1	9	10	10	10	10	10	5	3	3	3	3	3	3	10	10	10	10	3	3	3	3	3	3	3	10	10	10	6	6	6	6	6	6	3			
Drills-Jackhammer		3	3	3	11	19	19	19	19	10	10	10	10	10	10	10	10	10	19	19	19	10	10	10	10	10	10	10	10	10	10	8	8	8	8	8	8	8	5				
Compressors-Portable-300 c.f.m.	1	1	1	1	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5				
Compressors-Stationary-3000 c.f.m.																																											
Drill Shop							1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2						
Shovels	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	2	2	2	2	2					
Drag Lines	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	5	5	5											
HOISTING-ROLLERS-GRADERS																																										
Rollers		2	2	2	2	2	2	2					2	2	2	2	2						2	2	2	2	2	2	2	2													
Graders																																										
Hoists-Large	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Cranes	1	1	1	1	2	2	2	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Derricks	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
UNWATERING																																											
Pumps-Over 6"						1	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	6				
Pile Drivers	2	2	2	2	2	2	2					2	2	2	2								2	2	2																		
CONCRETING																																										
Cement Handling-Pumps							2	2	2	2	2	2	2	2	2						2	2	2	2	2	2	2	2				2	2	2	2	2	2	2	2	2				
Concrete Mixers-Portable	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
" Stationary							1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5
Concrete Buckets									7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
" Vibrators							8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Grouting Machines							2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
MARINE																																											
Barges	1	1	1	6	6	6	7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Towboats	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Derrick Boat							2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Launches	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Dredges																																											
	1935								1936												1937												1938											

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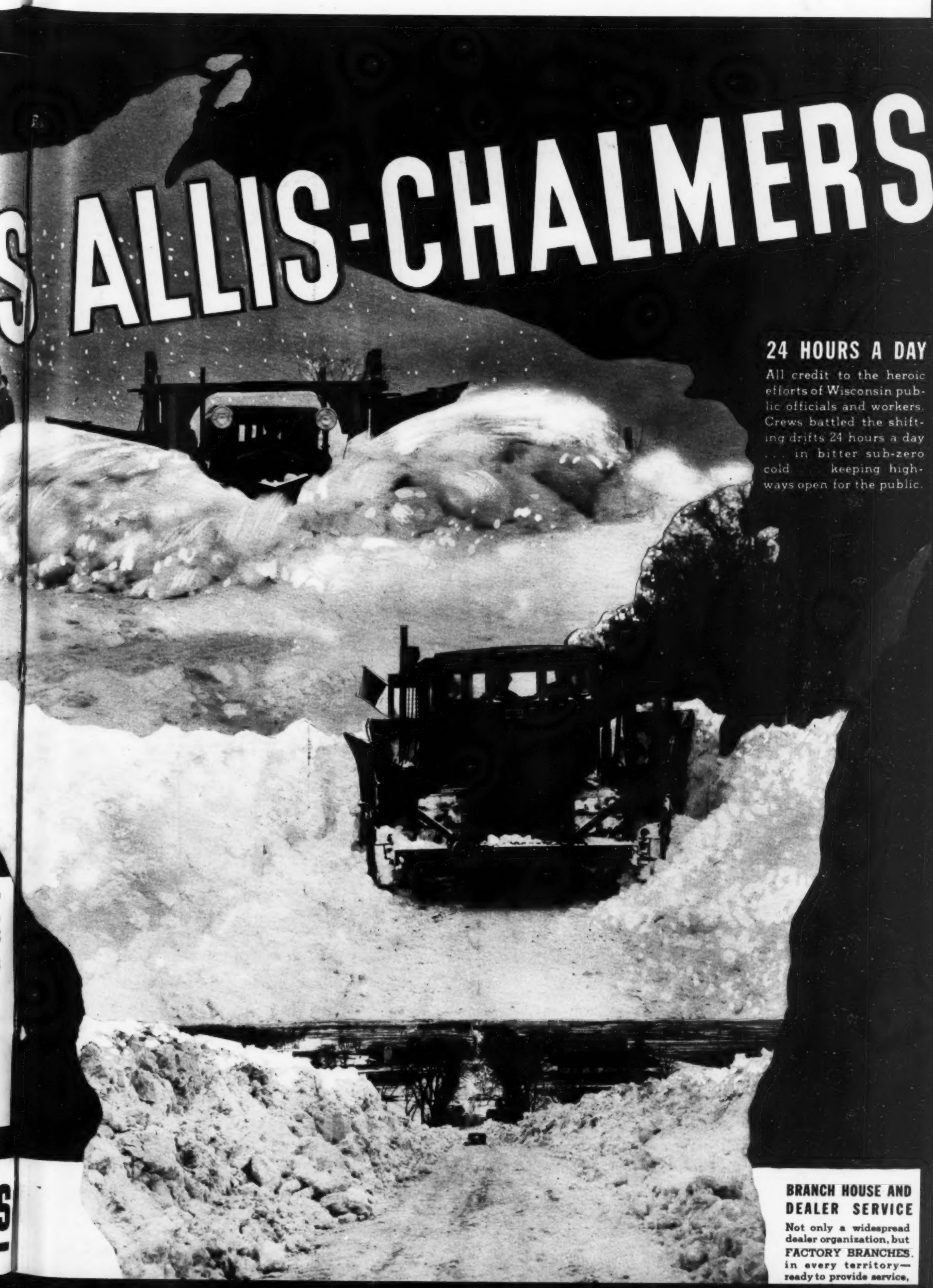

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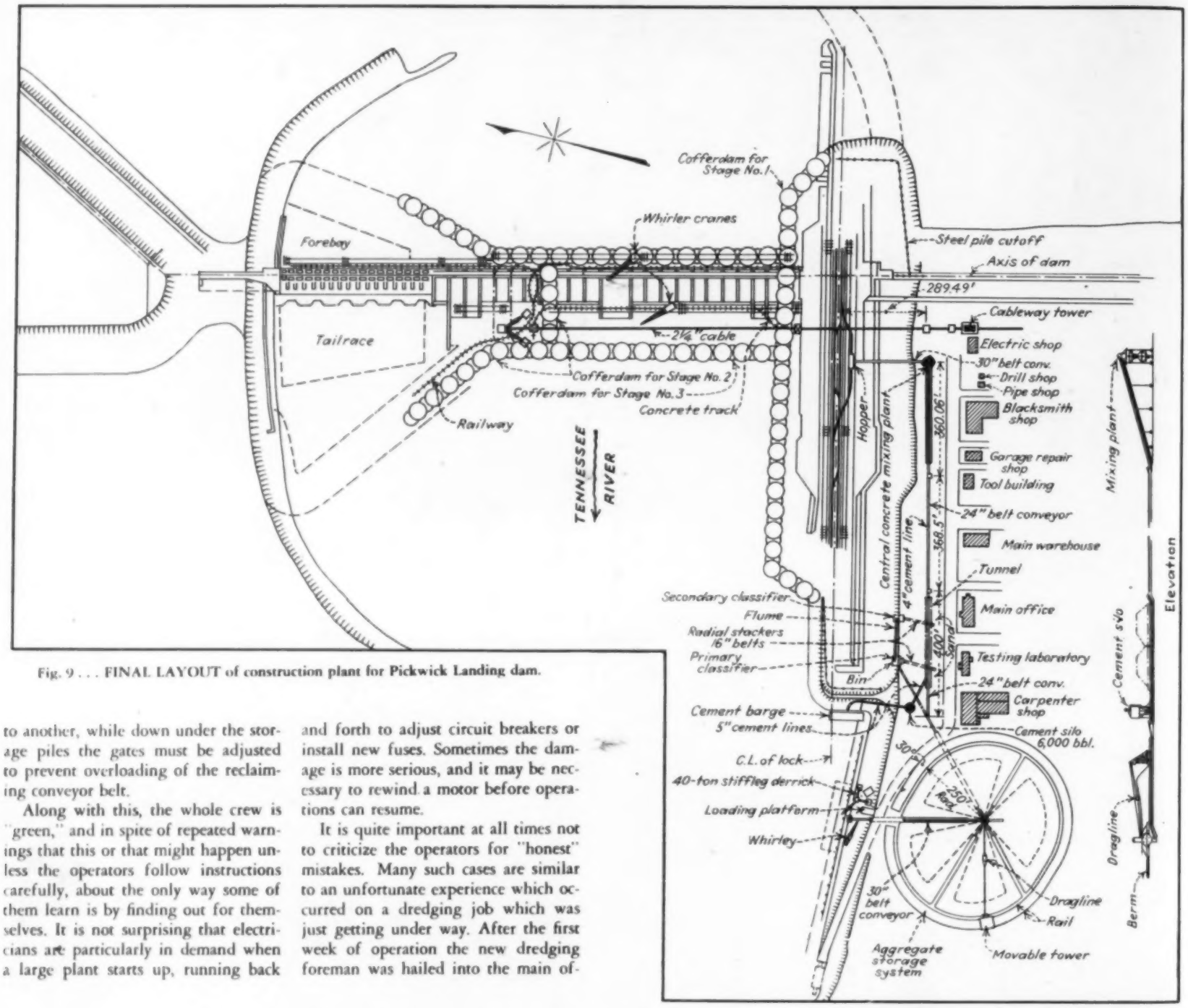


Fig. 9 . . . FINAL LAYOUT of construction plant for Pickwick Landing dam.

to another, while down under the storage piles the gates must be adjusted to prevent overloading of the reclaiming conveyor belt.

Along with this, the whole crew is "green," and in spite of repeated warnings that this or that might happen unless the operators follow instructions carefully, about the only way some of them learn is by finding out for themselves. It is not surprising that electricians are particularly in demand when a large plant starts up, running back and forth to adjust circuit breakers or install new fuses. Sometimes the damage is more serious, and it may be necessary to rewind a motor before operations can resume.

It is quite important at all times not to criticize the operators for "honest" mistakes. Many such cases are similar to an unfortunate experience which occurred on a dredging job which was just getting under way. After the first week of operation the new dredging foreman was hailed into the main office of the company and told that his services were no longer required. Wanting to know why, he was informed that he was not producing the results expected of him.

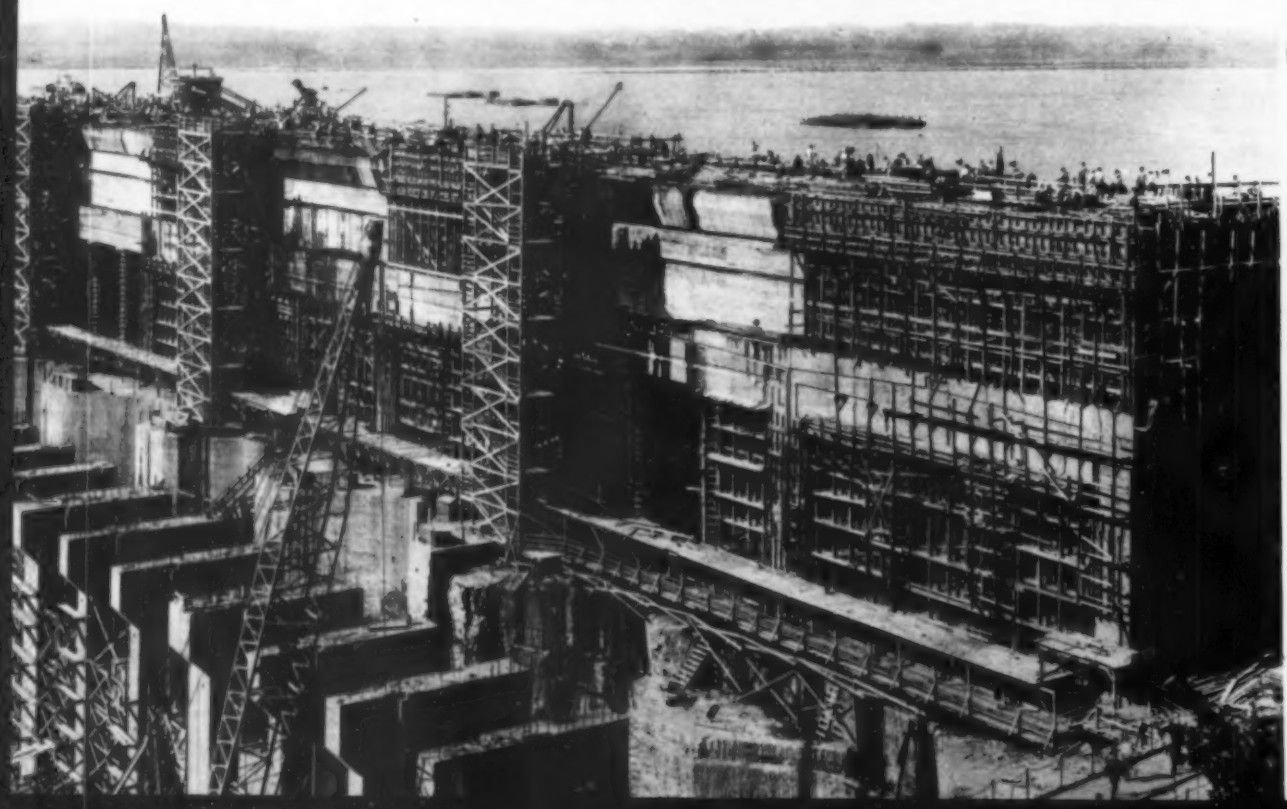
"But," he appealed, "that isn't my fault; I fired two operators already until I got that crew out there to learn that it costs money to take down and clean out a plugged pipeline, and since then everything has been going all right."

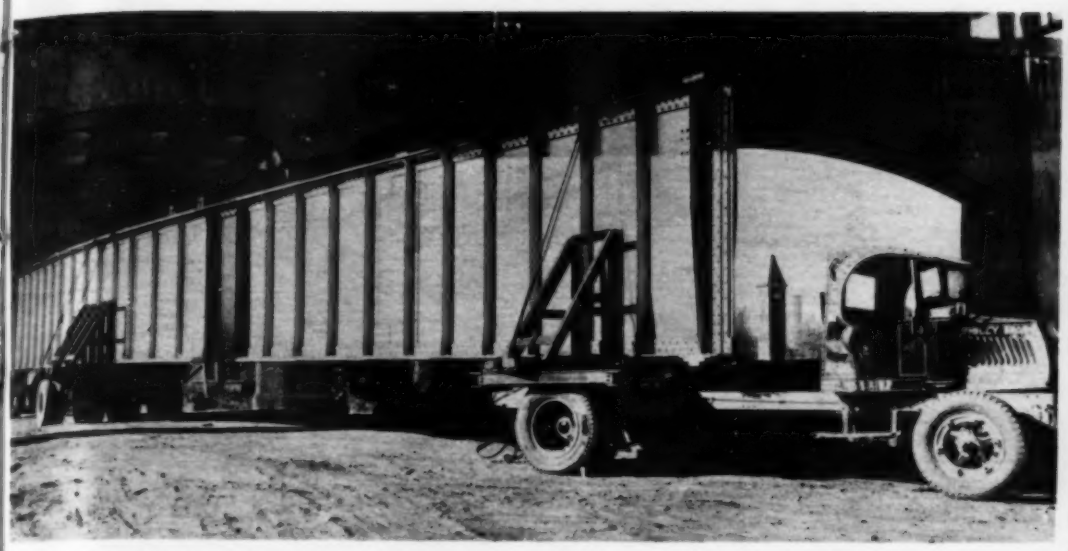
"That's just the trouble," he was told. "Those operators were trying to find out how thick a stream they could pump, and now you've got them all scared into pumping water and they are getting only half the yardage that the dredge is capable of moving."

❖

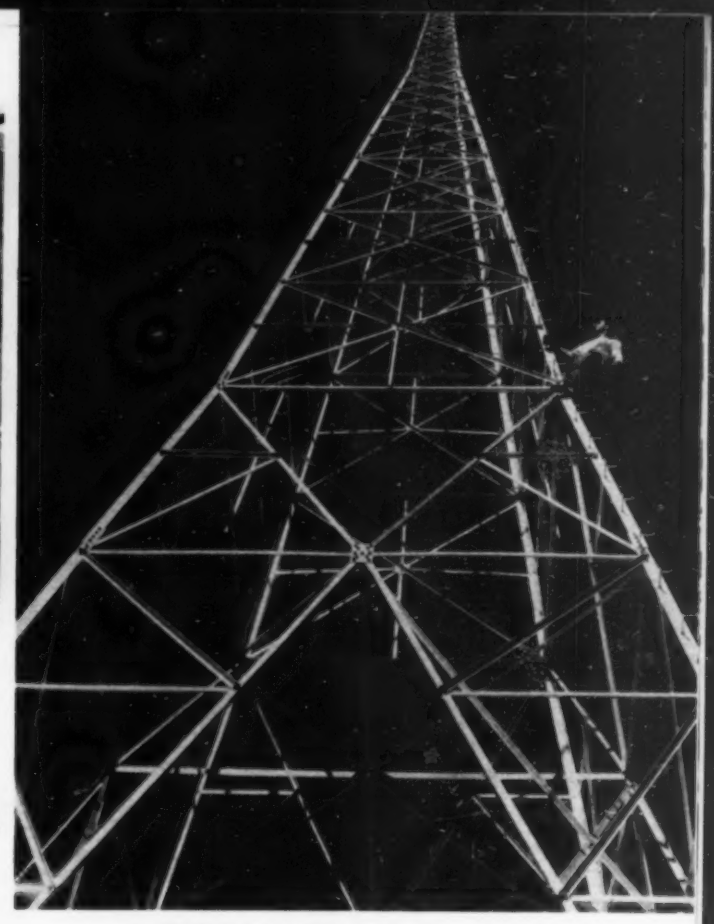
NEXT MONTH—Chapter 5 of the series on "Heavy Construction," by A. J. Ackerman and Charles H. Locher, to appear in the April issue, will deal with "Schedules," covering employment, materials finance and control.

Fig. 10 . . . SAFETY WALKWAYS and stairways help minimize accidents to workers on Wheeler dam.





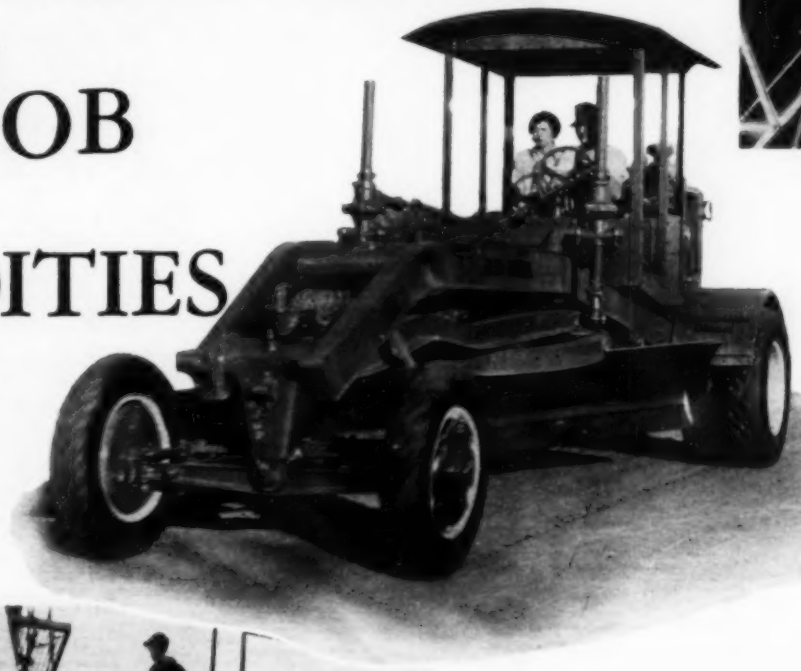
RIDING ON AIR incased in rubber 65-ton girder is transported by pneumatic-tired truck and trailer across Ward's Island to position for erection in viaduct span of Triborough bridge, New York City. Each pair of Kelly-Springfield tires on Vulcan wheels is carrying about 14 tons, an overload of 270 per cent above designed capacity. Bigley Bros., Inc., of Hoboken, N. J., delivers girders for McClintic-Marshall Corp., steel fabricator and erector.



FIREWORKS WARDEN, 155 ft. tall, diverts lightning strokes from switching station on 287-kv. transmission line being built from Boulder dam to Los Angeles, by Los Angeles Bureau of Power & Light. Six of these towers, arranged around two switching stations on line, are intended to protect station equipment against direct hits.

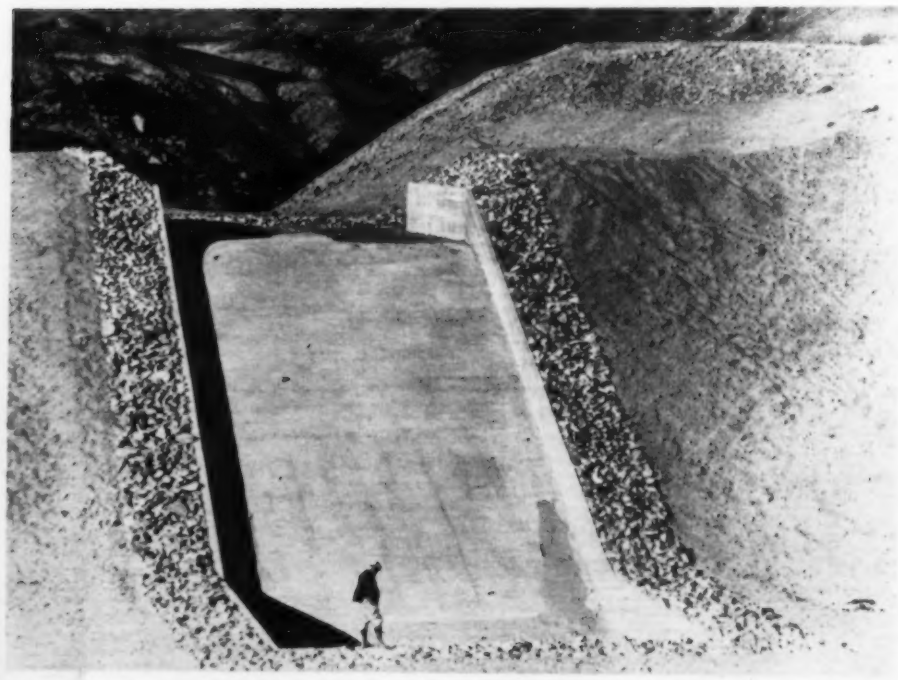
JOB ODDITIES

A Monthly Page of Unusual Features of Construction

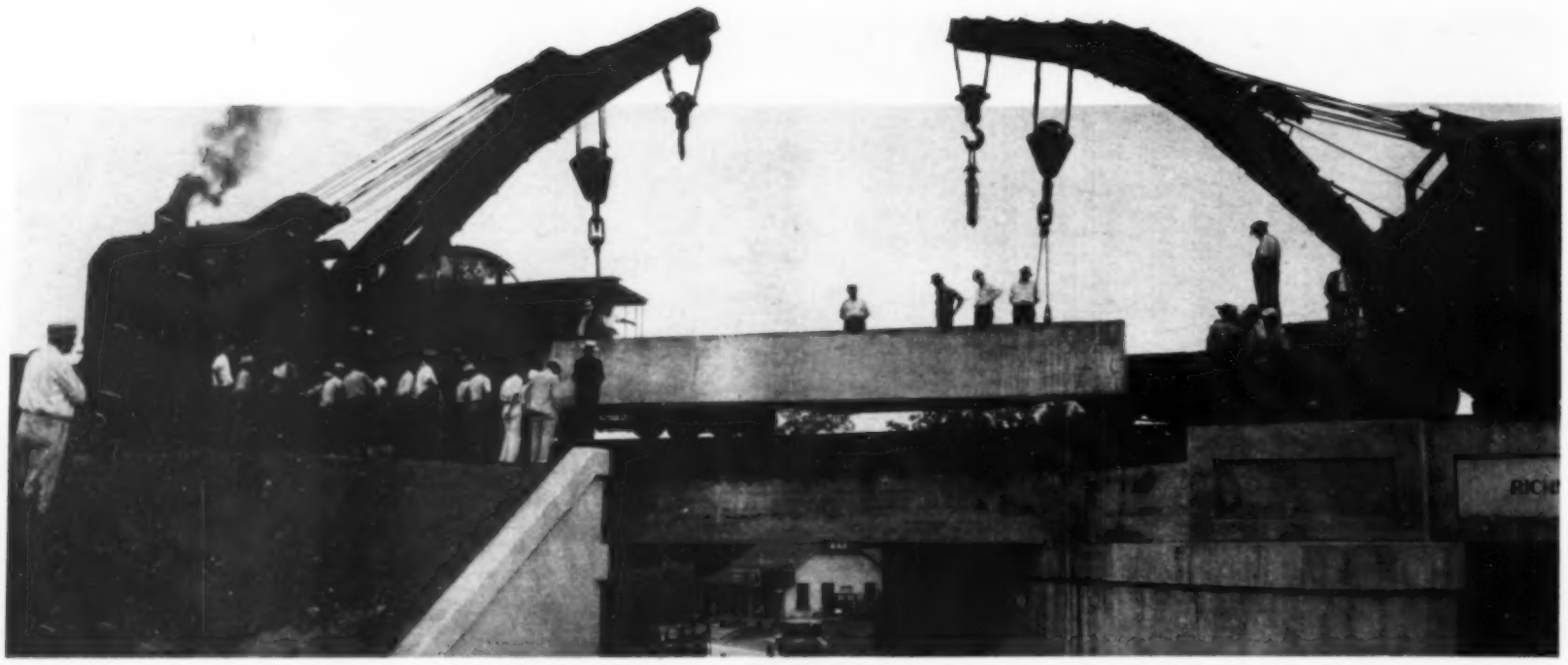


"ON A TRACTOR BUILT FOR TWO." Honeymooners make wedding trip on Caterpillar diesel auto patrol *(left)* when Serviceman Nance of Oklahoma Tractor & Equipment Co. persuades his fiancee to stop at parson's home and accompany him on delivery trip to Lawton, Okla.

ALL-AMERICAN INTAKE. Several dozen concrete wash intake structures *(below)* protect banks of All-American canal in California from erosion caused by rare floods in little desert canyons which cross canal.



MOUTHFUL OF MOTOR TRUCK *(left)*. White tractor unit of one of world's largest trucks, built to pull huge Austin-Western 25-30-ton trailer in background, nestles cozily in 30-cu.yd. dipper of Bucyrus-Erie electric stripping shovel at Bobolink strip coal mine, Seelyville, Ind.



TWO RAILROAD WRECK DERRICKS facing each other across opening in closed track of two-track main line lift precast slab off flat car on operated track and place it in position on center pier and abutment of new span.

Highway Underpass Widened With

PRECAST SLABS

EIGHT PRECAST concrete slabs 34 ft. 7 in. long, weighing a total of 300 tons, were utilized by the Virginia State Highway Department, with the cooperation of the Richmond, Fredericksburg & Potomac R.R. Co., to add a second span to a highway underpass on U. S. Route 1 at Giles Run, about 10 mi. south of Alexandria, Va., thus providing additional highway width at this point on a ½-mi. widening operation for which the Northern Virginia Construction Co., of Clarendon, Va., held the general contract. The second span duplicates in design the original bridge, constructed in 1927, which provided a 24-ft. opening for an 18-ft. concrete highway. Under its contract, the Northern Virginia Construction Co. added an 11-ft. widening strip to the existing 18-ft. pavement, increasing the width to 29 ft. At the bridge the former west abutment was converted into the center pier for the two-span structure, and a 24-ft. pavement was laid through the new opening to carry southbound traffic. Northbound traffic uses a 24-ft. pavement through the original underpass.

Preliminary Operations — Starting work in February, 1934, the railroad company installed five five-pile bents under each of two tracks at the site of the new span, driving 30-ft. timber piles with steel points into the ground and placing steel I-beam stringers on the caps to carry crossties. The bents were spaced to permit sloping the excavation behind the location of the new west abutment and constructing the foundation of this abutment without danger to the falsework.

In the spring, the general contractor directed L. M. Camden, of Richmond, Va., subcontractor for excavation, to start digging with his Bay City ⅜-yd. tractor shovel. This machine was small enough to dig among the pile bents and load light Ford and Chevrolet trucks at the rate of 350 to 400 cu. yd. per 10-hr. day. Excavation, consisting entirely of earth, was carried down 3½ ft. below subgrade of the pavement to firm bearing for the footing of the new west abutment. On top of the footing the contractor built a gravity-type abutment.

To convert the former west abutment into a center pier the wing walls first were removed by state highway forces. The contractor then cut steps in the sloping back of the gravity-type monolith and erected forms to carry up the new pier face in a vertical wall. The thickness of the pier, between the old and new vertical faces, is 8 ft.; an overhanging corbel at the top increases the thickness to 8 ft. 8 in.

About 575 cu. yd. of concrete was required for the new abutment and for the built-up section of the new center pier. This concrete was produced by a

EXISTING UNDERPASS, built in 1927, provides 24-ft. opening for 18-ft. concrete pavement, much too narrow for today's traffic needs on U. S. 1 in Virginia.

ADDED SPAN *(left)* resting at one end on old abutment converted into new center pier furnishes opening for southbound traffic. Original span passes northbound traffic.

Jaeger 10-S mixer at the site and was wheeled by hand to its place in the forms.

Casting Deck Slabs — Eight reinforced-concrete deck slabs for the new span were cast by the Northern Virginia Construction Co. on a specially prepared timber platform alongside a railroad siding in Alexandria. At the bridge the railroad crosses the highway at a 50-deg. skew. As a result, the slabs have a length of 34 ft. 7in., although the square width of the opening through which the highway passes is only 24 ft. The six inner slabs of the precast concrete deck are 3¾ ft. thick and 4 ft. 4 in. wide. Each of these slabs contains 7,370 lb. of steel reinforcement and 20.79 cu.yd. of concrete. The two outer slabs have parapets 1½ ft. high. Each of these slabs, 3¾ ft. thick and 3½ ft. wide, required 5,860 lb. of steel and 18.73 cu.yd. of concrete.

A casting platform of ⅞-in. tongue-and-groove sheathing on 2x4-in. sleepers, spaced 10 in. c. to c., was placed on a level sand bed to assure uniform distribution of the load of 300 tons of concrete. On this platform the contractor cast the eight slabs in a nest, first building the forms and placing the concrete for the alternate slabs. After these slabs had set the bulkheads were removed, the sides of the slabs were greased and the intermediate spaces were filled with concrete. By casting the slabs in this way the contractor assured a perfect fit of the eight deck units on the bridge.

Placing Deck Slabs — At the bridge site one track at a time was closed to permit the removal of rail, ties and temporary trestle and the placing of deck slabs. One wreck derrick picked up the slabs and loaded them on flat cars at the casting yard. While traffic on the railroad was operated on single track two wreck derricks standing on the abandoned track of the bridge removed the slabs from the flat cars on the operated track and set them in permanent position on the abutment and center pier.

Slab-placing operations required about the same amount of time on each of the two tracks. Slabs for the southbound track were set July 10 and those for the northbound track, July 11. On the latter date, the northbound track was put out of service at 7:40 a. m. After rails and ties had been removed, short rails were put in to enable the wreck derricks to get as close as possible to the opening. The derricks removed the stringers and trestle bents, completing this work at 8:25 a. m.

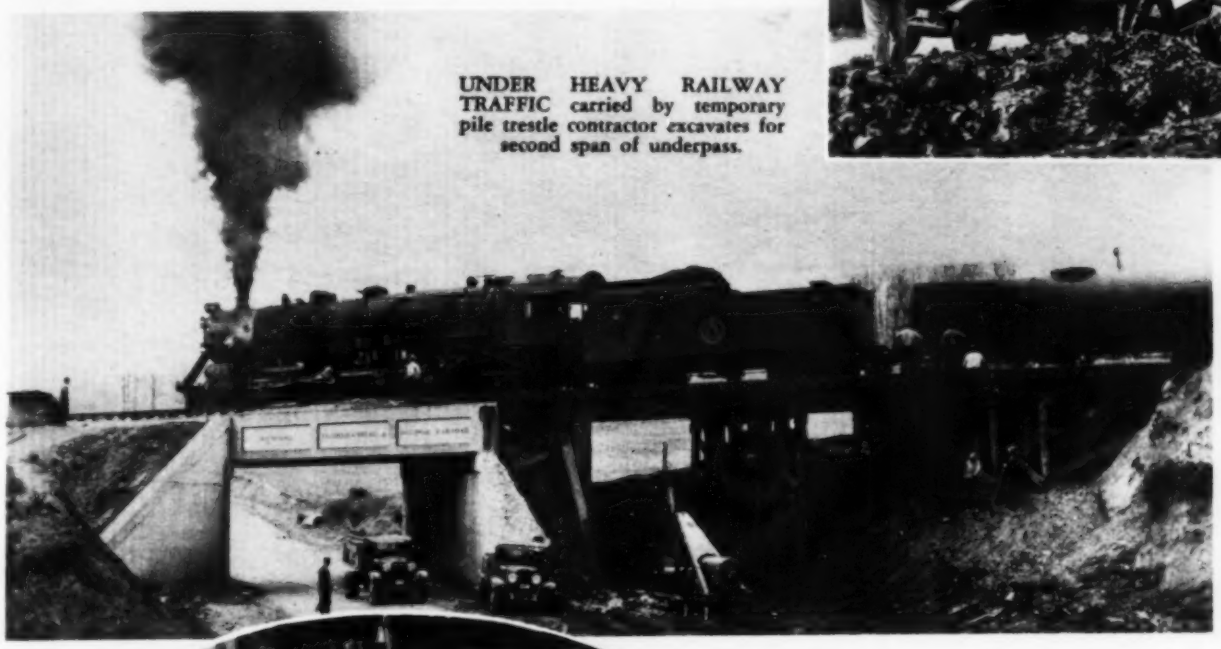
Subsequent operations were delayed until 9:40 a.m. to pass trains in both directions on the operated track. The slab train then was brought in on the operated track and the two wreck derricks unloaded and set the slabs, beginning on the center line between the tracks and working outward. After setting the first two slabs accurately in permanent position the derricks placed the third slab on these two. The outside slab then was unloaded to permit the slab train to clear from the operated track at 10:30 a.m. Work was interrupted until 10:50 by trains passing on the operated track.

All slabs were in place at 11:05 a.m., and the slab waterproofing was finished at 12:30 p.m. Trackwork was started immediately and the track was opened to traffic at 4:00 p.m. Total elapsed time for the complete operation was 8 hr. 20 min., during which the track was out of service.

Supervision—Plans for widening the underpass (as well as the plans for the original structure) were made by the engineering department of the Richmond, Fredericksburg & Potomac R.R. Co., under the direction of E. M. Hastings, chief engineer. J. C. De Jarnette, Jr., assistant engineer, is in charge of all bridge construction for the railroad. At the site, W. P. Winston acted as inspector, representing the railroad.

For the Virginia State Highway Department, C. S. Mullen is chief engineer and William R. Glidden is bridge engineer. Widening of the highway and underpass was performed under the supervision of J. M. Hagan, district engineer, and R. I. Mount, resident engineer, with E. F. LaPrade serving as inspector on the project.

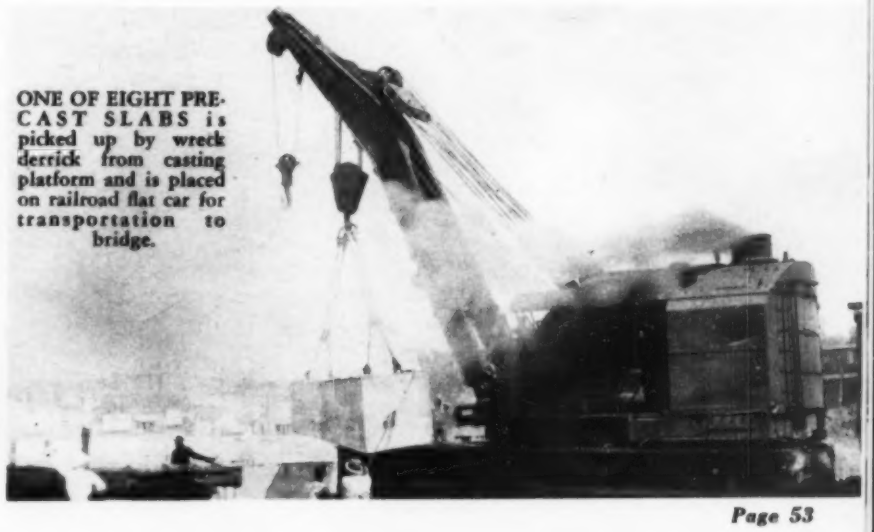
H. L. Harris, superintendent, directed operations for the Northern Virginia Construction Co., of Clarendon, Va., the contractor.



UNDER HEAVY RAILWAY TRAFFIC carried by temporary pile trestle contractor excavates for second span of underpass.

COMPACT EXCAVATOR is small enough to work between bents of temporary pile trestle, dropping ⅜-yd. dipperfuls into light trucks..

DIRECTING OPERATIONS: (left to right) E. F. LaPrade, inspector, and H. C. Wesson, Jr., junior inspector, Virginia Highway Department; L. M. Camden, subcontractor; W. P. Winston, inspector, R.F. & P.R.R. Co.; and H. L. Harris, superintendent, Northern Virginia Construction Co.



ONE OF EIGHT PRECAST SLABS is picked up by wreck derrick from casting platform and is placed on railroad flat car for transportation to bridge.

Photos, McPherson

Coulee Dam Concrete Placed From STEEL TRESTLES

FROM STEEL TRESTLES at two levels, one 160 ft. and the other 85 ft. above bedrock foundation, the Mason-Walsh-Atkinson-Kier Co. is operating gantry cranes handling 4-cu. yd. buckets delivered on flat cars to place concrete in the Grand Coulee dam on the Columbia River in Washington. Supported by columns 120 ft. high, an octagonal-shaped mixing plant, equipped with four 4-cu. yd. concrete mixers, supplies concrete at the rate of 320 cu. yd. per hour to the portion of the dam inclosed by the west cofferdam.

The two steel trestles, which will be embedded in the dam structure as concrete rises, are each 30 ft. wide on top and carry three lines of standard-gage track and, outside of these, rails carrying the gantry cranes. The first section of trestles in the west cofferdam is 1,300 ft. long. Ultimately they will be extended across the river to a total length of 300 ft.

The present contract with the U. S. Bureau of Reclamation at Grand Coulee dam involves the placement of 4,200,000 cu. yd. of concrete at an unprecedented rate of 12,000 cu. yd. daily this spring and summer when a second plant will be in operation.

F. H. FRANKLAND has been designated chief engineer of American Institute of Steel Construction, filling vacancy caused by death of Lee H. Miller, in 1933, since when Mr. Frankland has been performing duties of his new office in addition to those of technical director of association. Prior to joining Institute in 1928 he was vice-president and chief engineer of Bancroft-Jones Co., steel constructor of Buffalo, N. Y., and is a former partner of Waddell firm of consulting bridge engineers.

R. H. SHREVE, member of firm of Shreve, Lamb & Harmon, architects, of New York City, was elected general chairman of Construction League of the United States at that organization's fifth annual general assembly in Washington, D. C., Jan. 29. Among notable buildings which Mr. Shreve's firm has designed are Empire State, Bankers Trust and Insurance Co. of North America, in New York, and Acacia Mutual Life, in Washington. Mr. Shreve is a regional director of American Institute of Architects.

MICHAEL S. NILAND is new president of New York State Highway Chapter of Associated General Contractors of America. He is vice-president and general manager of C. B. Whitmore Co., of Lockport, N. Y., road-building contractors. Last year Mr. Niland served as vice president of chapter.

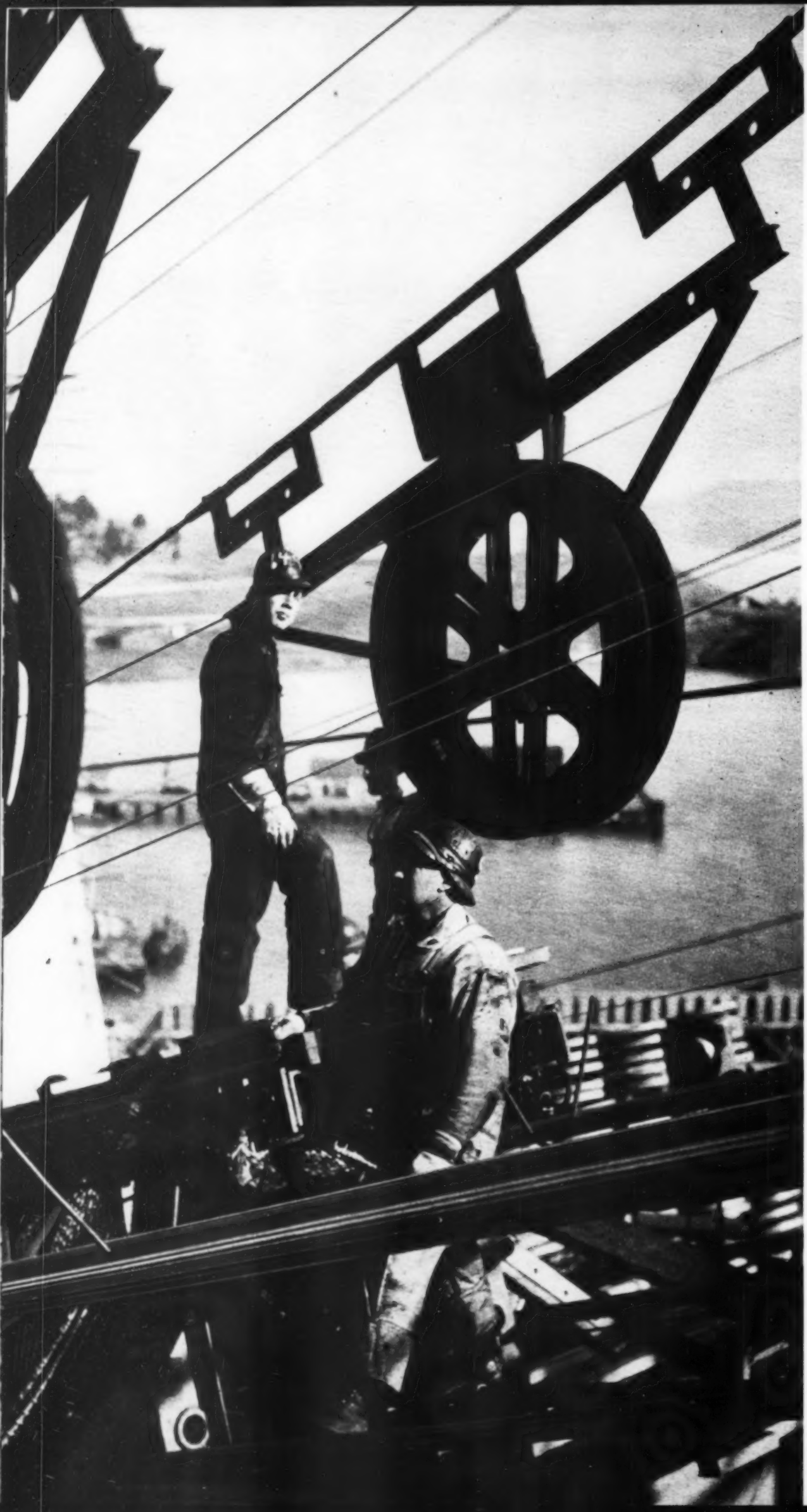
Present and Accounted For—

A Page of Personalities

W. P. TOWNSEND, of Greenville, Ohio, is contractor who used sectional canvas inclosure, made up of tarpaulin-covered panels designed for ready dismantling and erection, in building reinforced concrete bridges during winter weather, as described on page 37 of this issue.

GEORGE J. ATWELL, head of George J. Atwell Foundation Co., of New York City, is newly elected president of General Contractors' Association of New York. Mr. Atwell has specialized in foundation work and among recent large jobs he has handled have been those at Rockefeller Center and new Federal Post Office building in New York.

ARTHUR F. MATHIS, general contractor of Valley Junction, Iowa, is new president of Central Branch of Associated General Contractors of America. During World War he served with Constructing Quartermaster of Army at Camp Dodge, Ia., and then joined Empire Construction Co. on paving, grading and sewer work. In 1924 he became a partner of the E. L. Roger Construction Co. on sewer and waterworks projects. In 1932 he formed contracting company bearing his name. Mr. Mathis was first secretary of Central Branch of A. G. C. and was active during its organization period and, later, as a director.

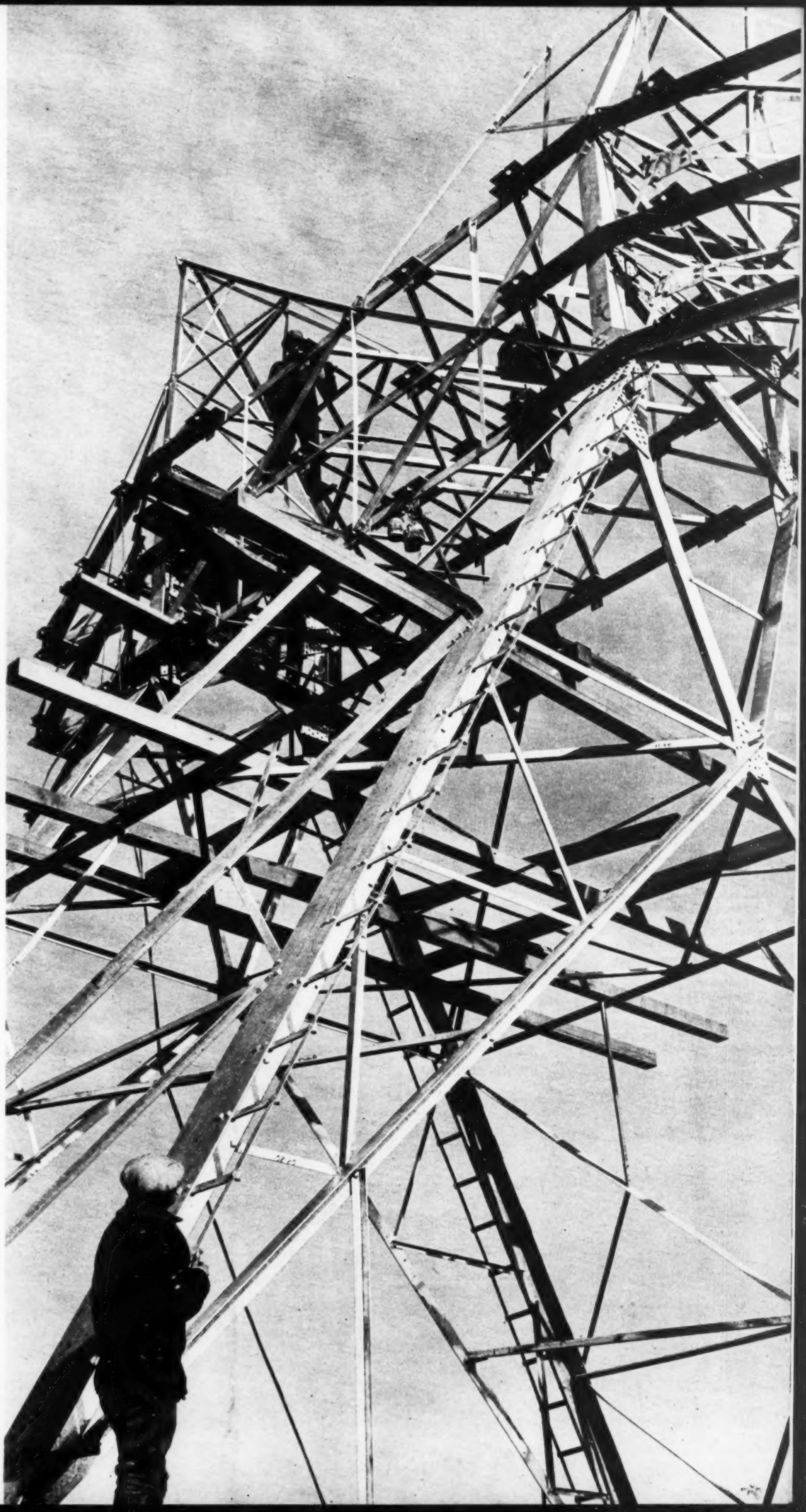


CABLE STRINGING

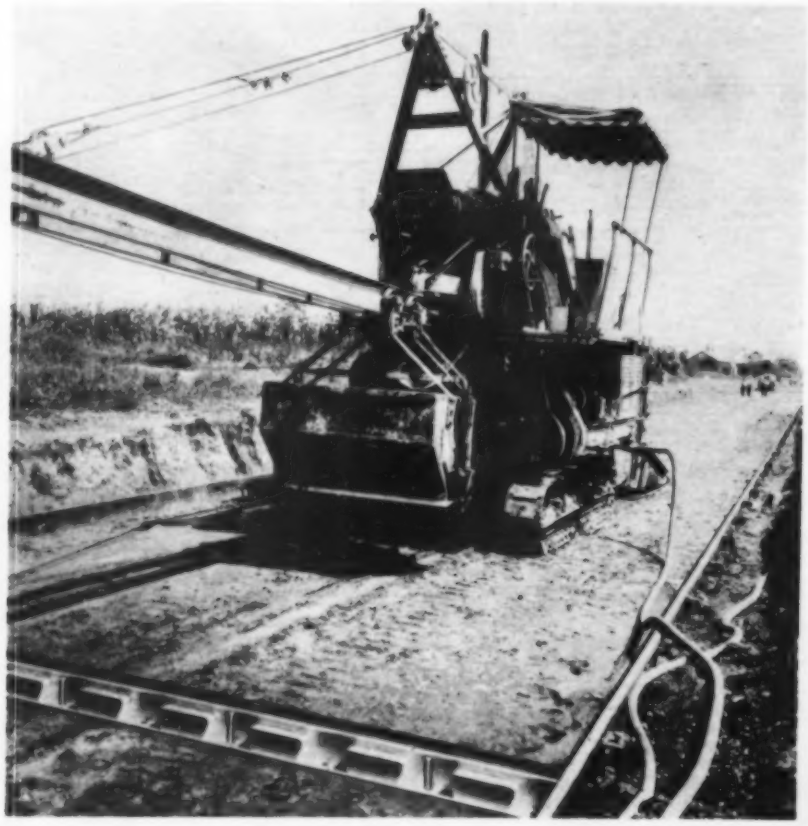
for 4,200-ft. suspension span — world's longest—of Golden Gate bridge at San Francisco has developed use of dual traveling sheaves, each carrying one loop (of two wires). View taken on east footbridge at Marin cable anchorage shows arrival and departure of traveling wheels. In foreground are cable strands being completed; each strand consists of 472 wires. Finished cables will have diameter of 36¼ in. — Photo, Standard Oil Co., Calif.

STEEL TOWER

takes form for carrying electric power transmission line across Missouri River near site of Fort Peck dam in Montana. Power line will serve dredges and other equipment for building structure 9,000 ft. long and 242 ft. high, containing 100,000,000 cu. yd. of hydraulically placed earth fill. This, the world's largest dam, is being built under direction of Corps of Engineers, U. S. Army, with an allotment of $50,000,000 from the Public Works Administration.



New Equipment on the Job

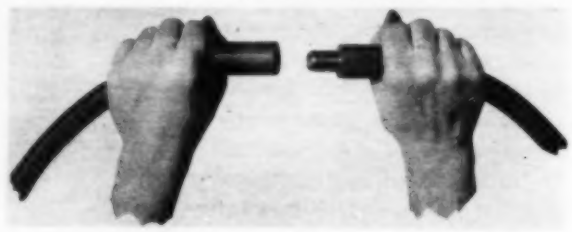


TRANSVERSE EXPANSION JOINTS (air- and elastic-cushion) and similarly designed contraction joint are designed to preserve smooth and even concrete highway surfaces and to permit free movement of pavements under expansion and contraction. These shop-assembled, self-contained units are made up of series of interlocking lugs and recesses so proportioned and spaced that strength of concrete is used to best advantage. Bottom, top and ends are arranged to prevent entry of foreign materials into body of joint. Air-cushion type provides 7/8-in. air space transversely in joint while in elastic-cushion type cork, rubber or other material, is mounted on steel surfaces. — Kalman Steel Corp., Bethlehem, Pa.

GREATER YARDAGE, less upkeep and lower fuel consumption are objectives striven for in designing this new 2¼-yd. convertible shovel, dragline and crane. Rotating frame is one-piece steel casting on which are mounted drum shaft supports. Extra large diameter drums are wide enough to carry maximum amount of cable without double wrapping when machine is operating as crane or on high lift work. All major motions are independent, making it possible to hoist, swing, travel and raise or lower boom at same time. Machine steered from operator's seat with cab in any position. Electrically welded boom and dipper handle. Independent crowd. All-steel cab. Equipped with oil, Diesel or electric power.—Lima Locomotive Works, Inc., Lima, Ohio.

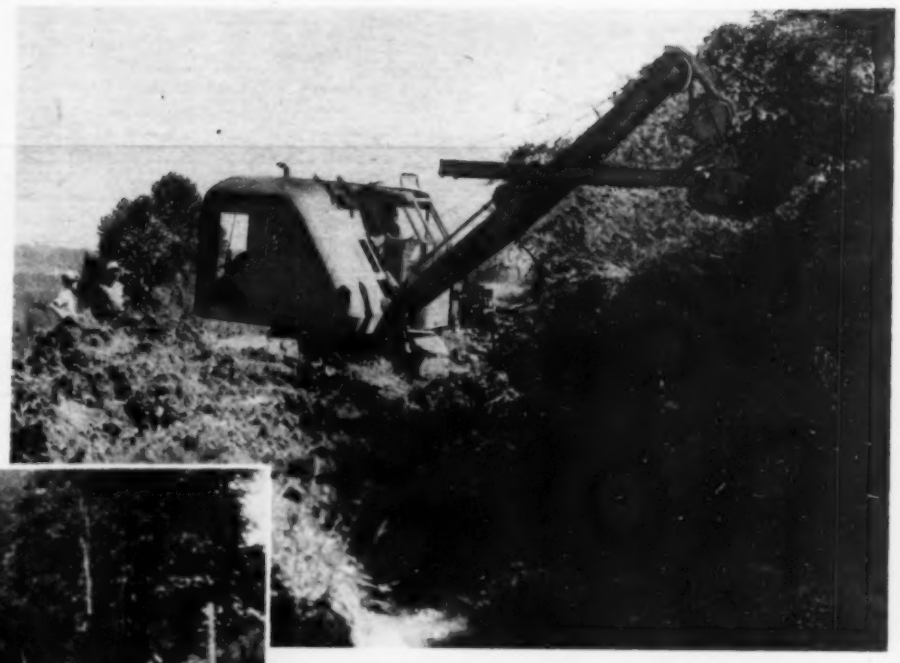
REINFORCING LATH *(right)* for suspended ceilings, tie-on partitions and all other types of tie-on work. Material, called Slotted Ecod Fabric, is said to be an effective saver of time and raw products and at same time to provide smooth, beautiful finish. New lath is slotted at regular intervals to permit tying on to ceilings under steel joists, flat slabs, arches or concrete joists. Time saved is increased by using large sheets, 8 ft. 1½ in.x31 in., which are sufficiently rigid for one man to handle and not so large as to require two men to install. Particularly adaptable for office remodeling, non-permanent partitions and all types of suspended ceilings. — Reynolds Corp., 19 Rector St., New York City.

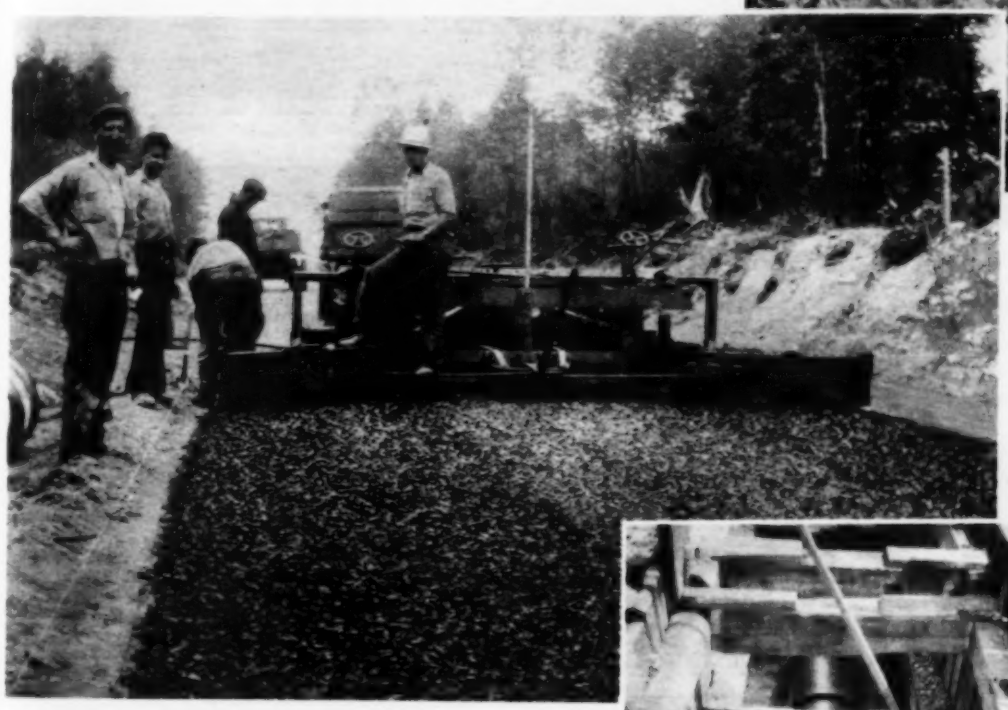
DETACHABLE CONNECTOR *(below)* is designed for use in connecting welding or electrode cable quickly and firmly. Locks in position and cannot work loose or be pulled apart accidentally. In operating connector, plug is inserted in jack and twist of wrist locks connection. To disconnect, procedure is reversed. Protection against grounding is insured by fibre insulating sleeves.—Lincoln Electric Co., Cleveland, Ohio.



POWER TAKEOFF *(left)* enables job welders, pipe-line contractors, steel erectors, repair shops and other arc-welding users to install generator on any standard 1½-ton truck and drive welder from truck motor. Made in various models to operate as direct drive or from side. Adaptable to all makes and models of trucks. Does not affect road speed or power of truck since it simply replaces portion of truck's drive shaft. Power supplied by any 1½-ton truck is sufficient to drive either 200- or 300-amp. welding generator. Takeoff can be controlled from driver's seat by single lever. Will transmit 120 brake hp. at 2,800 r.p.m., 220 ft.-lb. torque.—Hercules Steel Products Co., Galion, Ohio, and Lincoln Electric Co., Cleveland, Ohio.

½-YD. SHOVEL *(right)* utilizes 32 Timken roller bearings to provide faster start on every swing and to cut 20 to 30 per cent off swinging time required, thereby saving time for trucks and men. Additional features: (1) Three main assemblies and one shaft assembly in lower deck perform all hoisting, swinging, crowding, traveling and steering operations. (2) No additional machinery except drum lagging required to operate shovel, clamshell, dragline or trench attachments. (3) All gears operate in oil. (4) Bucket trip is power actuated. (5) Controls are placed immediately in front of operator where he can perform all operations while seated. (6) Power is applied directly to various shafts, eliminating friction waste of intermediary gears. Two travel speeds in both forward and reverse—low gear for 30 per cent grades and high gear for speed of 132 ft. per minute. Has modern style, larger cab with sliding doors and more windows for visibility—Byers Machine Co., Ravenna, Ohio.





FINISH-SPREADER *(left)* for spreading and finishing all kinds of plant-mixed material, stone, slag and gravel. Unit is attached to truck and spreads material as received from dump body moving forward along road. Less than 3 min. required for entire operation of attaching to truck, spreading and detaching. Use of finish-spreader assures closer texture in road surface and accurate control of depth of material. With it material may be packed tightly against curbs or headers. Useful and economical in resurfacing and repairing old roads as well as in construction of new highways.—Blaw-Knox Co., Pittsburgh, Pa.

Fig. 1 . . . RUBBER GASKET is placed in bell socket by hand

RUBBER PIPE JOINT

For use with specially constructed ceramic pipe in low pressure service—a maximum of 15 lb. per square inch—and in temperatures not exceeding 175 deg. F. Provides permanent, positive seal for bell-and-spigot pipe conveying acids, alkalies, sewage and other industrial wastes. Consists of rubber ring or gasket having internal and external circumferential ribs which grip bell and spigot of pipe. Gasket permits easy insertion of spigot, and corrugations and resilience of rubber form multiple seal which resists tendency of pipe sections to pull apart. Effect of pressure is to make joint tighter. Claimed to be watertight, root-proof and flexible. Does not deteriorate with age, resists corrosion and serves to cushion and align pipe. — B. F. Goodrich Co., Akron, Ohio.

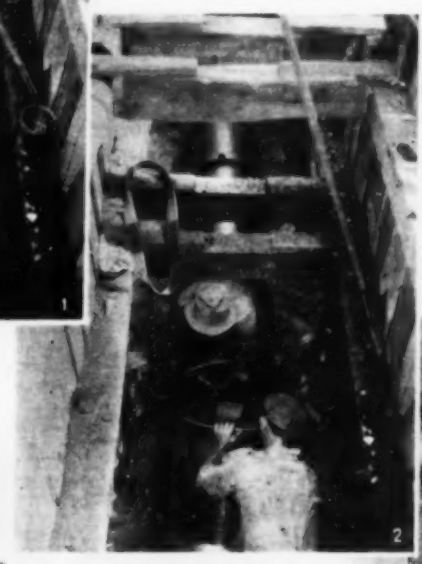


Fig. 2 . . . INSIDE SURFACE of rubber and outside contact surface of spigot are painted with lubricant.

Fig. 3 . . . SPIGOT is propelled into bell with aid of crowbar.

POWER FINEGRADER *(below)* for efficient preparation of subgrade cuts grade to exact cross-section, removes excess soil and smooths surface leaving it in firm, hard condition, accurate as to measurement and with a minimum of voids. In operation, series of cutting knives move forward with rotary motion, loosening and lifting out soil with each stroke. Blades have great power, being oscillated over 1¼-in. stroke at rate of 185 r.p.m. Cutting is gradual and positive. Excess material is tossed back into path of elevating flights traveling across road and is deposited on shoulder of road through discharge conveyors at ends of machine. Cutting blades and smoothing members easily adjustable to any cross-section giving machine complete versatility for all specifications. Made in two adjustable sizes, 8 to 12 ft. and 18 to 20 ft.—R-B Equipment Mfg. Co., 721 E. New Hampshire Ave., Royal Oak, Mich.

If You Want Further Information—

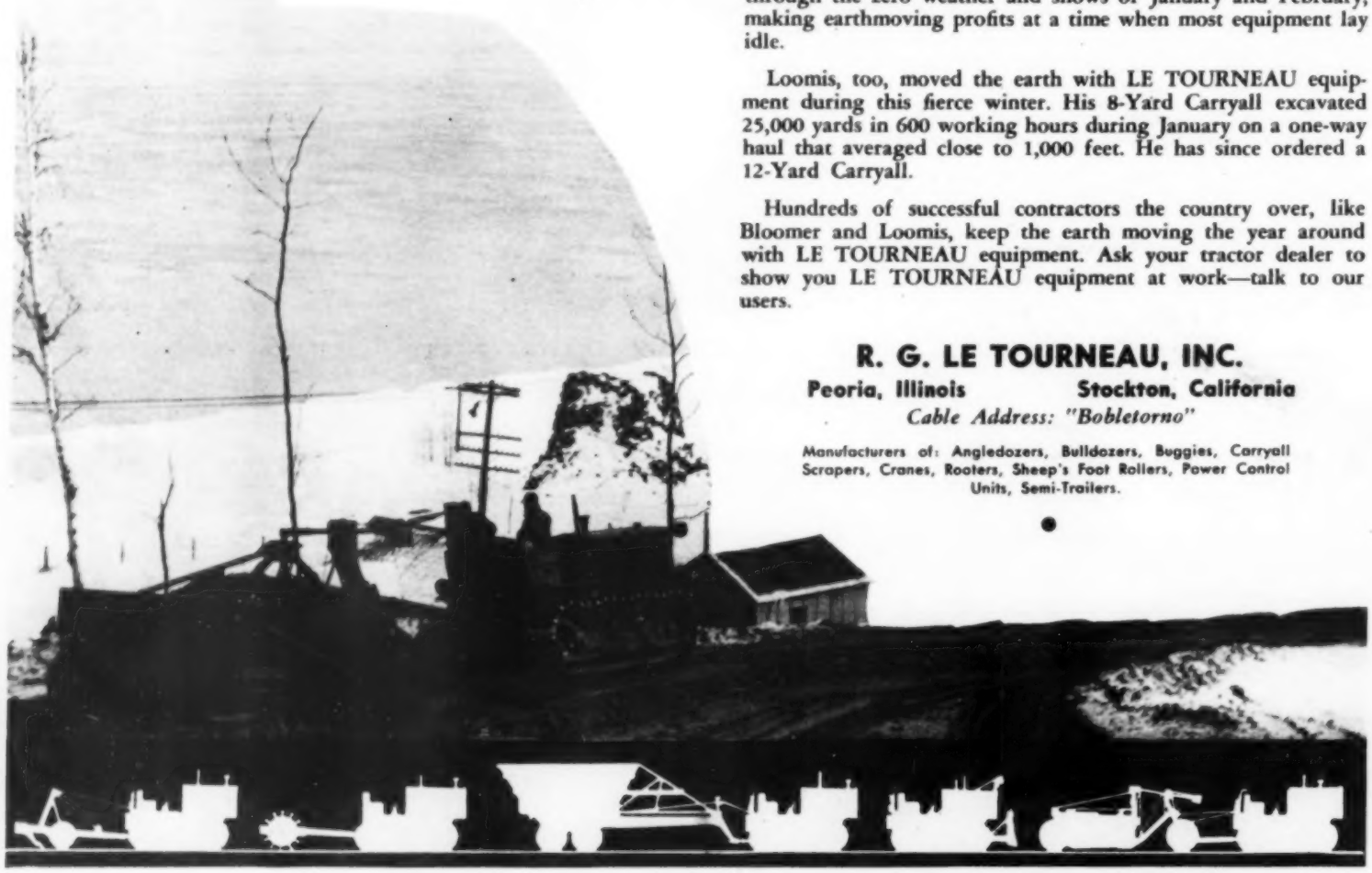
Within the space limits of this page it is impossible to present complete information about the products illustrated.

The manufacturers, however, will be glad to supply further details if you will write to them.

Sub-zero January weather, but these LE TOURNEAU 12-Yard scrapers, two of three, worked the clock around for John F. Bloomer.

LE TOURNEAU moves the earth ... despite zero weather

Loomis' 8-Yard delivers 41 cubic yards hourly through 600 icy hours on this highway job overlooking Lake Superior.



Neither contractors John F. Bloomer nor Claude M. Loomis believe in letting the earth freeze under their feet. They move it too fast for that..

Up near Iron River, Wisconsin, Bloomer has worked three 12-Yard LE TOURNEAU Carryalls steadily 24 hours a day through the zero weather and snows of January and February, making earthmoving profits at a time when most equipment lay idle.

Loomis, too, moved the earth with LE TOURNEAU equipment during this fierce winter. His 8-Yard Carryall excavated 25,000 yards in 600 working hours during January on a one-way haul that averaged close to 1,000 feet. He has since ordered a 12-Yard Carryall.

Hundreds of successful contractors the country over, like Bloomer and Loomis, keep the earth moving the year around with LE TOURNEAU equipment. Ask your tractor dealer to show you LE TOURNEAU equipment at work—talk to our users.

R. G. LE TOURNEAU, INC.

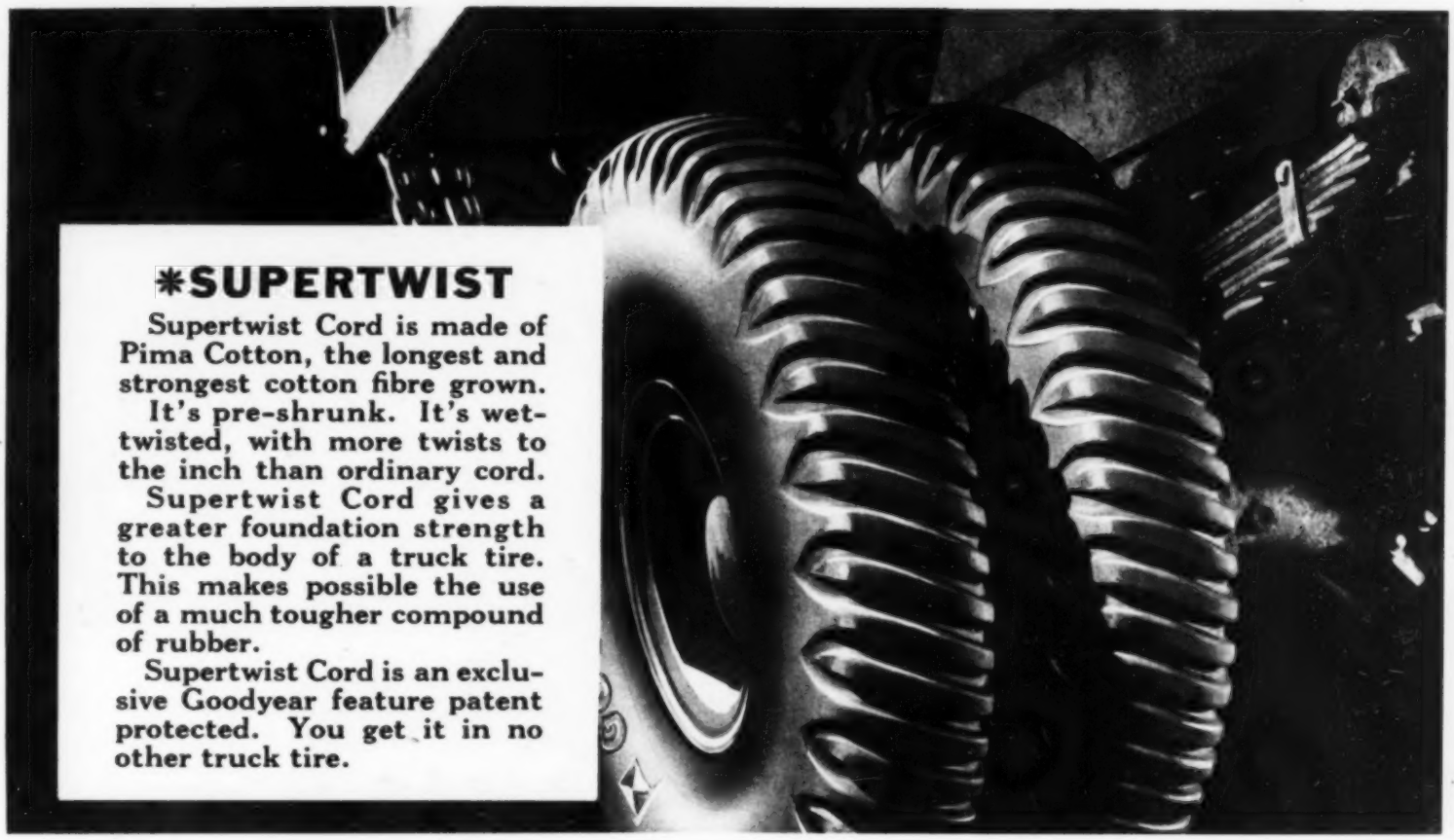
Peoria, Illinois **Stockton, California**

Cable Address: "Bobletorno"

Manufacturers of: Angledozers, Bulldozers, Buggies, Carryall Scrapers, Cranes, Rooters, Sheep's Foot Rollers, Power Control Units, Semi-Trailers.

WHAT DOES SUPERTWIST* MEAN

Under a Dump Truck?



***SUPERTWIST**

Supertwist Cord is made of Pima Cotton, the longest and strongest cotton fibre grown.

It's pre-shrunk. It's wet-twisted, with more twists to the inch than ordinary cord.

Supertwist Cord gives a greater foundation strength to the body of a truck tire. This makes possible the use of a much tougher compound of rubber.

Supertwist Cord is an exclusive Goodyear feature patent protected. You get it in no other truck tire.

DUMP TRUCK OPERATORS are enthusiastic about this new Goodyear Lug Type Balloon Tire. They like the way those heavy, diagonal tread bars grip, bite down and pull in rough, broken ground—in ruts—in sand—wherever their trucks go.

They like, too, that tough, durable body of Supertwist Cord. It gives them long tire life, dependable performance, more miles . . . lower cost per ton-mile hauling.

Try this New Goodyear on your dump trucks. You'll agree—it's a MONEY SAVER.

These are the reasons why you'll save money with your dump trucks on Goodyear Lug Type Balloons—

- **MAXIMUM TRACTION**—because of those heavy, self-cleaning lugs that bite down and hold.
- **EXTRA-STRONG BEAD CONSTRUCTION**—for heavy, swaying loads.
- **HIGH PROFILE TREAD SHAPE**—more rubber on ground, more pulling power.
- **GREATER BODY STRENGTH**—because of Supertwist cord.
- **HEAT-RESISTING RUBBER**—blow-out protection, longer wear.
- **PIMA COTTON**—longest cotton fibre grown.

Ask for more information about this new Goodyear Truck Tire that's built for the kind of work your trucks do.

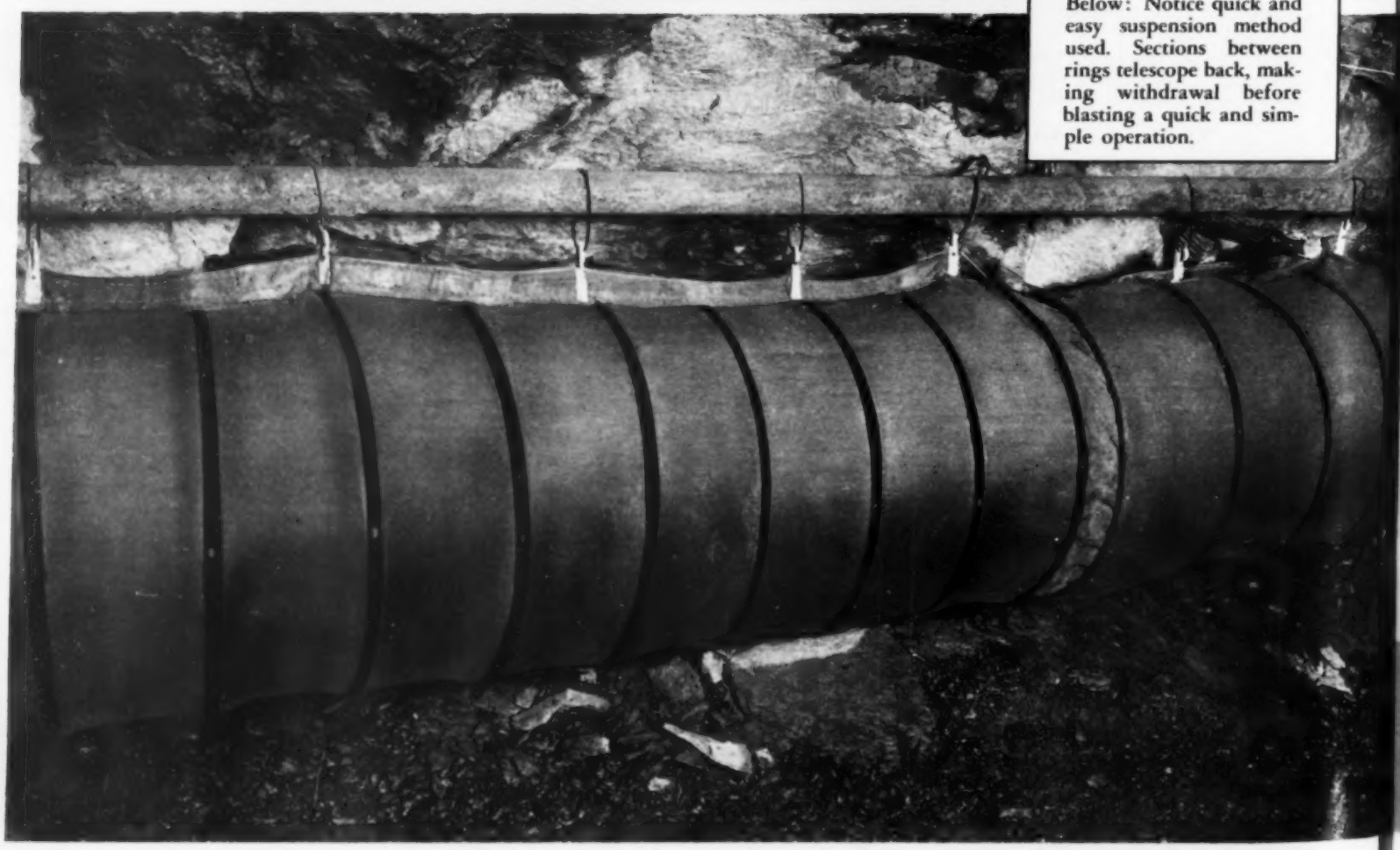
THE GOODYEAR TIRE & RUBBER COMPANY, INC., AKRON, OHIO

GOODYEAR

LUG TYPE BALLOON

DUPONT NOW

Above: Non-collapsible "VENTUBE" in place as permanent ventilating duct. Notice how rings inside and out keep duct rigid.
Below: Notice quick and easy suspension method used. Sections between rings telescope back, making withdrawal before blasting a quick and simple operation.



ANNOUNCES

NON-COLLAPSIBLE

"VENTUBE"

Tested Successfully Under Actual Operating Conditions
With Exhaust Fan And As Means of Diverting Air Flow.

After successful tests in actual mining and tunneling operations, du Pont now announces non-collapsible "VENTUBE".

"VENTUBE", long established as a flexible ventilating duct for all tunneling operations now adds to its fields of service an economical and time-saving use as a non-collapsible duct. This was accomplished through the use of metal rings put permanently in position both inside and out.

It has a number of advantages for tunneling projects that establish it as a necessary tool for the mining and construction engineer.

In short lengths, non-collapsible "VENTUBE" is an economical and time-saving method of ventilating shafts, through the use of an exhaust fan.

It will lend itself to ventilation jobs where the induction method is considered necessary.

Where unusual conditions are met with in tunnel driving, fresh air can be supplied with regular "VENTUBE" and all bad air eliminated from the face by the use of an exhaust fan situated at the tunnel's mouth and hooked up to a line of non-collapsible "VENTUBE".

Its lightness and flexibility eliminates up to 50% of the installation charges necessary in installing more inflexible systems.

A 45° turn can be made with non-collapsible "VENTUBE" without loss of time. Its flexibility makes it possible to run it behind mine props without seriously affecting its efficiency, thus saving space in gangways and main headings.

When used in rock tunnel work it can be telescoped back out of the way before firing, eliminating the possibility of being crushed due to concussion or rock falling. It telescopes back in accordion fashion.

Its flexibility in dismantling provides a further time-saving over non-flexible ventilating systems.

It can be used successfully without fans in diverting air. Tests under actual operating conditions prove its value in this use.

For further information on prices, etc., please write to

E. I. DU PONT DE NEMOURS & CO., INC.
Fabrikoid Division
FAIRFIELD, CONNECTICUT

DU PONT VENTUBE REG. U. S. PAT. OFF.

DON'T LET THEIR LOW COST MISLEAD YOU!

"Getting the most for your dollar" is a particularly important consideration today.

But, in praising the *economy* of low-cost asphalt roads and streets, don't fail to consider, too, their *ruggedness.* The compact, resilient toughness of both the low-cost asphalt types, road-mix and plant-mix, enables them to cope easily with the traffic of most roads and streets.

So expertly are low-cost asphalt surfaces constructed today that the uninitiated person is unable to distinguish them from the more expensive, heavy-duty asphalt types.

This year, bear in mind not only the *economy,* but also the *durability* and *safety* of low-cost asphalt surfacing with TEXACO Asphaltic products.

TEXACO

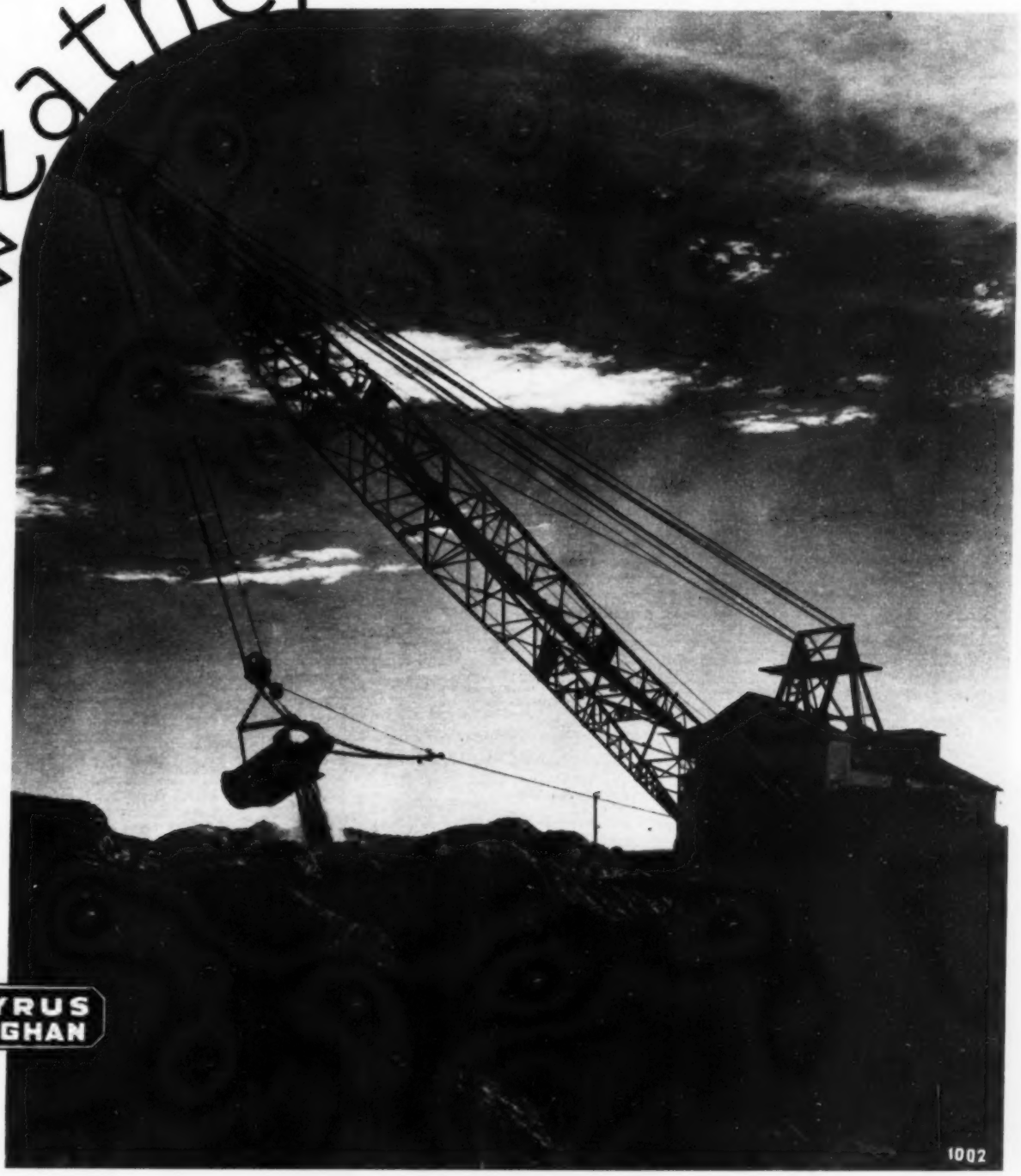
THE TEXAS COMPANY
Asphalt Sales Dept.
135 East 42nd Street, New York City

Buffalo, Philadelphia, Richmond, Boston, Jacksonville, Chicago, Cleveland, Kansas City, Mo., Houston, Dallas

TEXACO asphalt

WHETHER weather or no, Bucyrus-Monighan walking draglines keep right on delivering big output at low cost. They don't mire down because, when digging, their ground-bearing pressure is distributed over the whole area of the base. The walking shoes are raised high off the ground, come down on fresh, unchurned sections when it's time to "walk" again. If a deep hole is encountered, the shoes can be raised and turned to a new location, or supporting material placed under them. If you "weatherproof" your jobs with Bucyrus-Monighans, you will be "Singing in the Rain" with profitable, all-weather output. Manufactured by Bucyrus-Monighan Company, Chicago, Illinois.

weather



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Sold by

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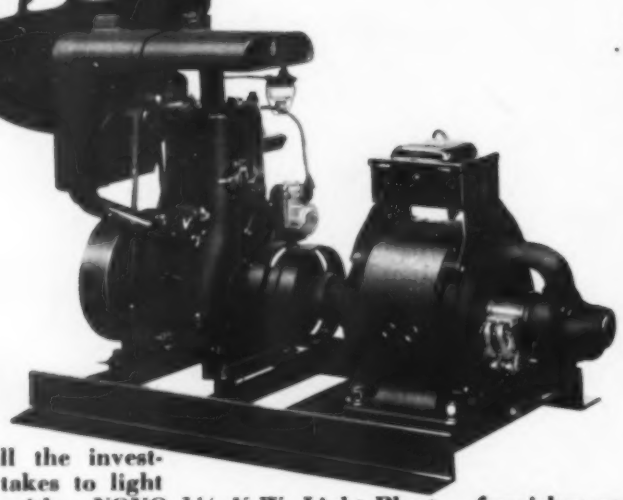
EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

LIGHT
for the lamps of Contractors

$216.00



That's all the investment it takes to light your job with a NOVO 1½ K.W. Light Plant — furnishes unfailing, unflickering light for night operation or power for small electric tools — will light 60—25 watt or 15—100 watt bulbs all night long for only a few cents per hour.

A full range of sizes up to 7½ K.W. They are exceedingly compact and easy to install.

Truck mounting furnished for portable light plants.

PUMPS

NOVO SELF-PRIMING CENTRIFUGAL

Get the new low prices on the Model "V" Pumps that have greater VALUE and a greater VOLUME. They are simple and compact in design due to the UNIT ASSEMBLY. Built in 5 sizes 2" to 4".

Also a Heavy Duty line of Self-Primers 2" to 6" — 10,000 to 90,000 gal. per hr. capacity.

PRESSURE PUMPS • ROAD PUMPS
JETTING PUMPS • DIAPHRAGM PUMPS
Also — Hoists & Dragline Hoists

Send the coupon for full information. There is no obligation.

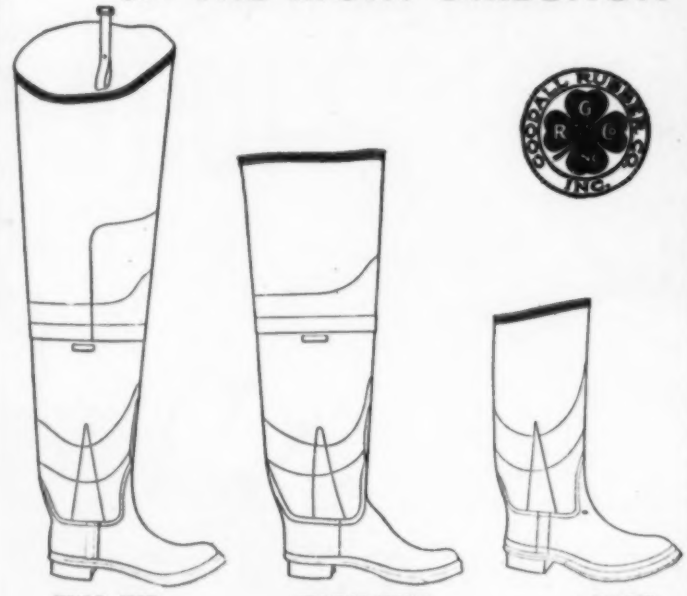
PUMPS HOISTS ENGINES
NOVO
ENGINE COMPANY
LANSING MICHIGAN U.S.A.
LIGHT PLANTS STARTING UNITS

NOVO ENGINE CO.
214 Porter St., Lansing, Mich.

Send me literature on the following:

NOVO Light Plants ..... NOVO Road Pumps .....
NOVO Self-Primers ..... NOVO Hoists .....
NOVO Pressure Pumps ..... NOVO Dragline Hoists .....

A BOOT
IN THE RIGHT DIRECTION



FULL HIP — STORM KING (¾ hip) — SHORT

Rubber boots are made for many varied services

BUT

GOODALL BOOTS

are built especially for use on construction jobs

Reinforced at every point of stress and strain and with a very high quality rubber sole and heel stock, which is carried up over the toe in the form of a cap, assures long service under the hardest conditions.

Phone our nearest branch or distributor—immediate delivery all lengths and sizes from stock.

Try them on your next requisition and be convinced that

"GOODALL" IS A BOOT IN THE RIGHT DIRECTION

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Branches:
San Francisco • Seattle • Portland
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GOODALL — The originators of the "Standard of Quality" Line (Reg. U. S. Pat. off.) of contractors rubber goods.

Not a Spectacular "Movie Shot" *but...*

It Delivered the Goods!

A section of the face of a quarry in California before the blast was fired

View of blast. *Note the lack of escaping gases* although the entire burden is in motion

View of blast after dust and smoke had partially covered the quarry face

An after-blast view showing the large, blocky stone that was wanted for breakwater

STUDY this tribute to Atlas explosives and Atlas service *through the eyes of the camera*. Examine this photographic evidence of explosives operating without waste—of confined gases exerting *all* their force on the rock burden!

Large, blocky jetty-stone was wanted for breakwater use by the Rohl-Connolly Co., operators of the Riverside Quarries. "Seventy percent of the rock," they said, "must weigh ten tons or more!" Atlas gave them 225,000 tons of *what they wanted*—proving again the economy and effectiveness of controlled explosives' force.

Let the Atlas representative give you the full facts about Atlas explosives and Atlas service. Atlas will provide high tonnage per pound of explosives to get the fragmentation *you* want!

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

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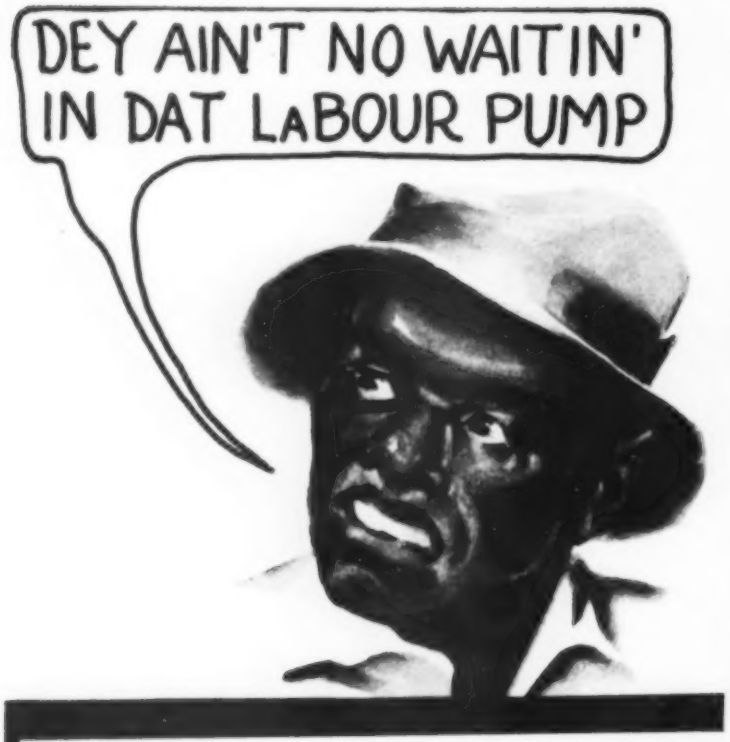
ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES



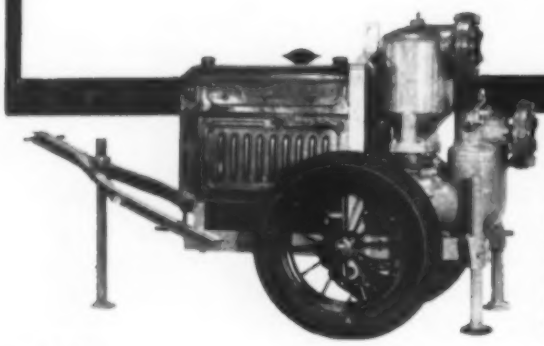
● A simple Negro, WPA worker, recently learned an important fact about LaBour Pumps—a fact which can mean more money to you.

For several weeks he had been "employed" on a job where two pumps (not LaBours) had been trying to keep the water out of the excavation. Then a LaBour was put to work, and in 30 minutes the area was dewatered. The colored fellow grumbled as he foresaw the end of long hours of idleness—on pay.

"Ought to git dem other pumps back," he muttered. "Dey ain't no waitin' in dat LaBour Pump."

To this shiftless son of Africa, the prompt effectiveness of the LaBour Pump was a sad story indeed—but to the man who pays the bills, lost labor time is a far different matter. If you want pumps that do their work promptly and effectively, you'll find what you are seeking in LaBour.

THE LABOUR COMPANY, INC.
304 Sterling Avenue
ELKHART, IND.



LaBour Type WPD, a portable unit extensively used by contractors. LaBour self-priming pumps are manufactured for gasoline or electric drive, and in capacities up to 1500 G.P.M.

Foundations, Abutments and Footings — Hool and Kinne
Structural Members and Connections — Hool and Kinne
Stresses in Framed Structures — Hool and Kinne
Steel and Timber Structures — Hool and Kinne
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Answers to your problems in structural engineering always at your finger tips

EVERY man concerned with the design and construction of civil engineering structures of any type should have these practical books with their helpful tables, diagrams, reference data, best methods and details.

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6 Volumes—3575 pages—fully illustrated

The most valuable library obtainable for any man concerned with the design and construction of civil engineering structures of any type.

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CM-3-36

It Paid *to forget the old stuff!*

One contractor saved one-half bag cement per yard by replacing tunnel lining equipment with the Rex Pumpcrete.

Another added nine pounds cement per yard above specifications and cut all his original estimates of cost by using the Rex Pumpcrete.

The Pumpcrete was brand new to both companies, but once they met it—they forgot the *old stuff.*

Equipment that is already owned, methods of the years before, are often the worst drawbacks in getting low costs on the job.

In 1936, before you buy, before you bid, investigate the Up-to-Date Methods of Handling Concrete.

CHAIN BELT COMPANY
1664 West Bruce Street Milwaukee, Wisconsin

ASK US WHICH?

The Up to Date Methods of Handling Concrete

REX

CHAIN BELT COMPANY

Construction Equipment

It makes no difference!

One of the Loup River, Nebraska Projects

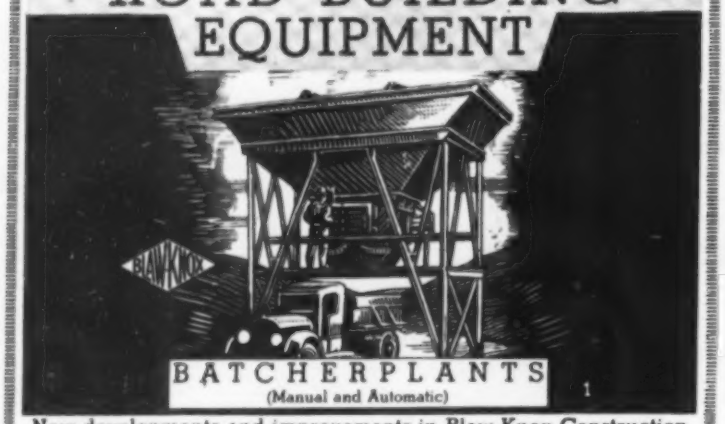
Where or what your wet job is . . . . . .
How much water you have . . . . . .
Or what the material is . . . . . .

A Moretrench Wellpoint System can *bone dry* it — with *sure results* — and *at the lowest cost.* THERE ARE MANY REASONS. We rent or sell for the largest or the smallest job.

MORETRENCH CORPORATION

Sales Office: 90 West St., New York City — Works: Rockaway, New Jersey

BLAW-KNOX ROAD BUILDING EQUIPMENT



New developments and improvements in Blaw-Knox Construction Equipment are right in step with today's program.

With a background of years of practical experience, Blaw-Knox equipment is trustworthy. It is economical and low in maintenance. Designed to stand up under severe operating conditions, it is fitted to the job by skilled engineers. It helps immeasurably to fulfill contracts speedily and profitably.

BLAW-KNOX COMPANY, 2086 Farmers Bank Building, Pittsburgh, Pa.
Offices and Representatives in Principal Cities

BLAW-KNOX ROAD BUILDING EQUIPMENT
Includes:—
BATCHERPLANTS · ROAD FINISH-SPREADERS
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CEMENTANKS · STEEL BUILDINGS · STEEL GRATING
Literature on any of the above BLAW-KNOX Products will be sent upon application.

Section of Railroad Tunnel Under the East River, New York City, being waterproofed with—

Sika

Use Sika to stop the inflow of water through dams, walls of pump houses, man-holes, filter beds, sewage tunnels, etc. Sika mixed with portland cement is easily applied by hand and will successfully seal off infiltration from underground streams even under pressure.

Write us about your problems.

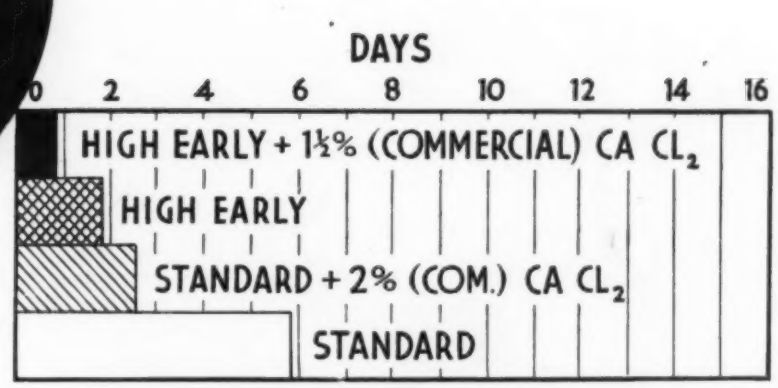
Sika, Inc.

1943 Grand Central Terminal, New York City

No matter what Portland cement is used CALCIUM CHLORIDE

increases STRENGTH AND SHORTENS CURING TIME

2500 LBS. "OPENING STRENGTH" IN LESS THAN HALF THE TIME WITH EITHER HIGH EARLY STRENGTH OR STANDARD CEMENTS



CALCIUM CHLORIDE is a time-tested and proven material for speeding the hardening of cement. It adds desirable qualities to *all* Portland cements.

At all ages and in all temperatures, Calcium Chloride hastens the rate of hardening and produces higher early strength. The chart at the right shows a test in which an "opening strength" of 2500 pounds was obtained, through the use of Calcium Chloride, in less than half the time required for mixes not including Calcium Chloride. Calcium Chloride is particularly valuable as an accelerator for cold weather work, whether for buildings, floors, pavements, bridges, or other concrete structures.

Calcium Chloride is approved by the U. S. Bureau of Public Roads, the U. S. Bureau of Standards and other leading authorities. It has fifteen years of successful performance to its credit.

Write any of the following association members for further information.

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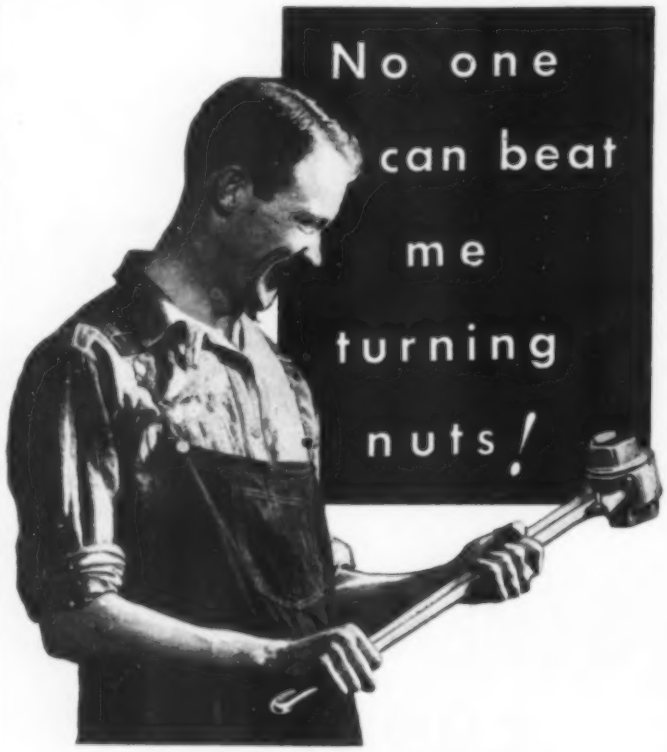
CALCIUM CHLORIDE
FOR MODERN CONCRETE CURING



—not when I use
the fast **NEW**

"FAVORITE"

REVERSIBLE RATCHET WRENCH!

We couldn't improve the speedy RATCHET Streamline motion of the "FAVORITE"! We couldn't better the "FAVORITE" basic idea that the wrench *never leaves the nut* until the nut is tight! No sir—but we HAVE made this famous wrench STRONGER, rust-proof. We've put better, stronger metal and better design into handles, heads and pawls. We plated it with CADMIUM to prevent rust. You'll get even better, longer service now from the NEW-model "FAVORITE." Send that coupon, below, for all the details.

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A speedy way to find out how

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Name .....

Address .....

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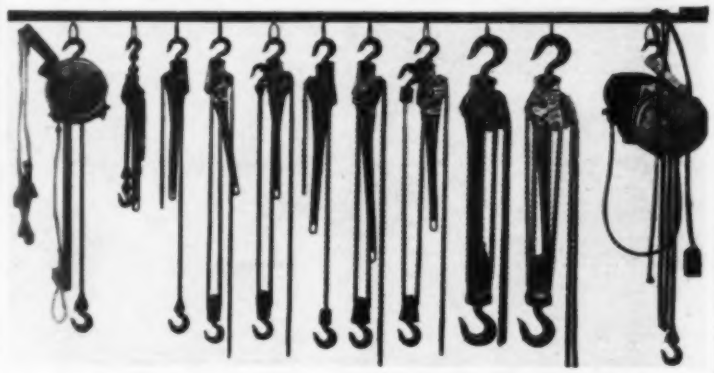
COFFING *ADVANCED DESIGN* HOISTS

RATCHET LEVER · SPUR · GEAR · ELECTRIC · LOAD BINDERS



Coffing Ratchet Lever Hoists are LIGHT, COMPACT, POWERFUL and PORTABLE. They operate on a straight ratchet principle. Loads are raised or lowered by short strokes of the lever. Hoists are available in a wide variety of sizes, up to six tons capacity, weighing from 14 to 65 pounds.

More Coffing Ratchet Lever Hoists are being used today than ever before. They are doing the lifting and pulling for such varied requirements as garages, railway shops, building construction, pipeline laying, stringing electric line, and hundreds of others. They are light in weight, and easily transported and operated by one man.

All Coffing Hoists are factory tested to operate SAFELY at 100% over rated load capacity.

Model F, 1½ tons, Coffing Ratchet Hoist being used for lifting the spider off a truck from under a 90-foot boom electric shovel.

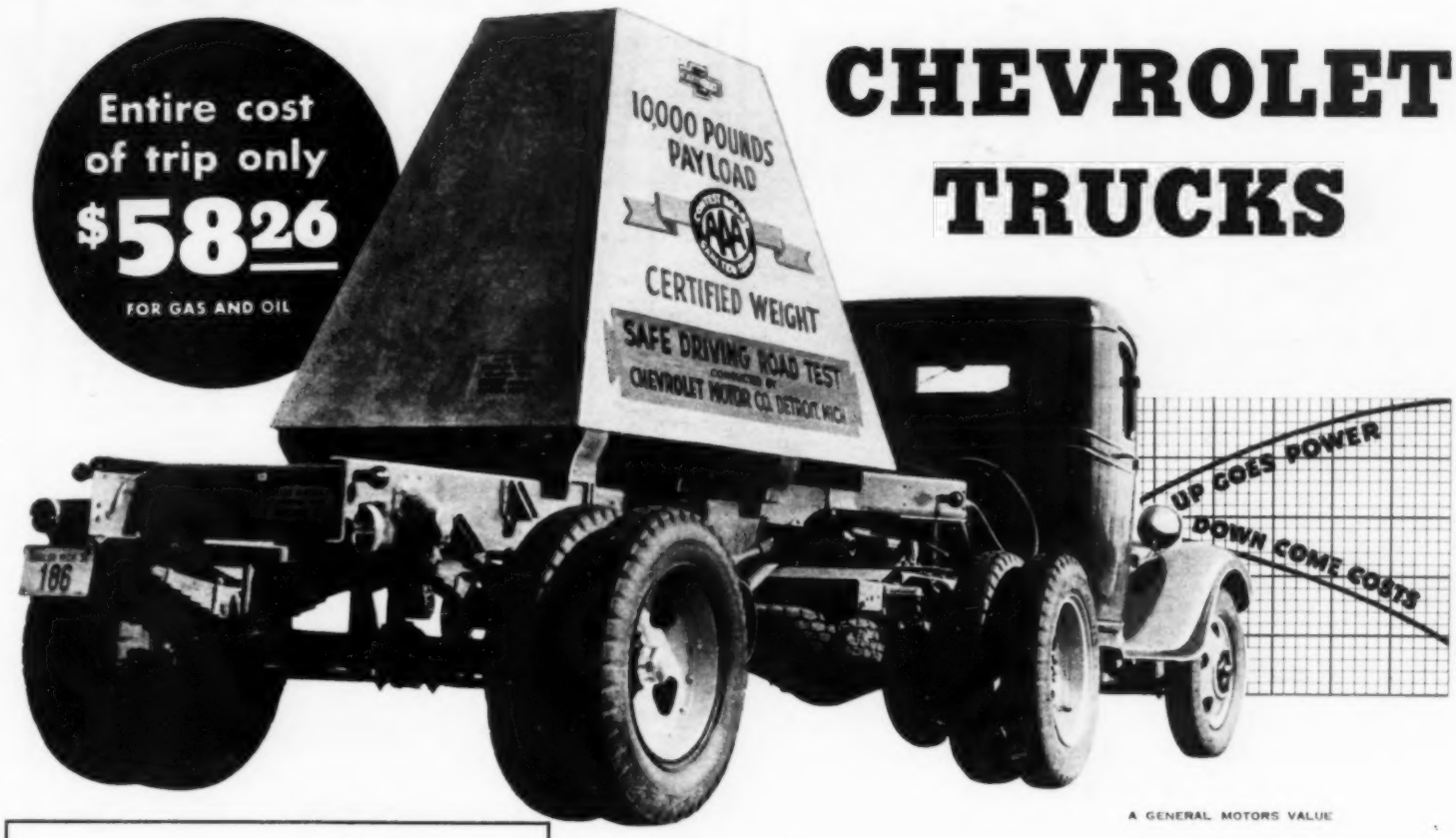
For further information and prices, see your nearest jobber or write direct to:

COFFING HOIST CO.

• DANVILLE ILLINOIS •

Amazing coast to coast trip with 10,000-pound payload establishes economy leadership of

CHEVROLET TRUCKS



A GENERAL MOTORS VALUE

Truck Users in the BUILDING AND CONSTRUCTION INDUSTRIES

Look at this
UNMATCHED RECORD
then let
CHEVROLET TRUCKS
reduce your haulage costs

Location of Test	Los Angeles to New York
Distance Traveled	3511.5 miles
Running Time	129 hours, 24 minutes
Average Speed	27.14 miles per hour
Gasoline Used	308.6 gallons
Gasoline, miles per gallon	11.378
Oil Consumption	2 quarts
Cost of Fuel	$57.59
Cost of Oil	$.67
Fuel and Oil (cost per mile)	$.016
Average cost per ton mile	$.00328
Water Consumption	1 gallon

No mechanical failures

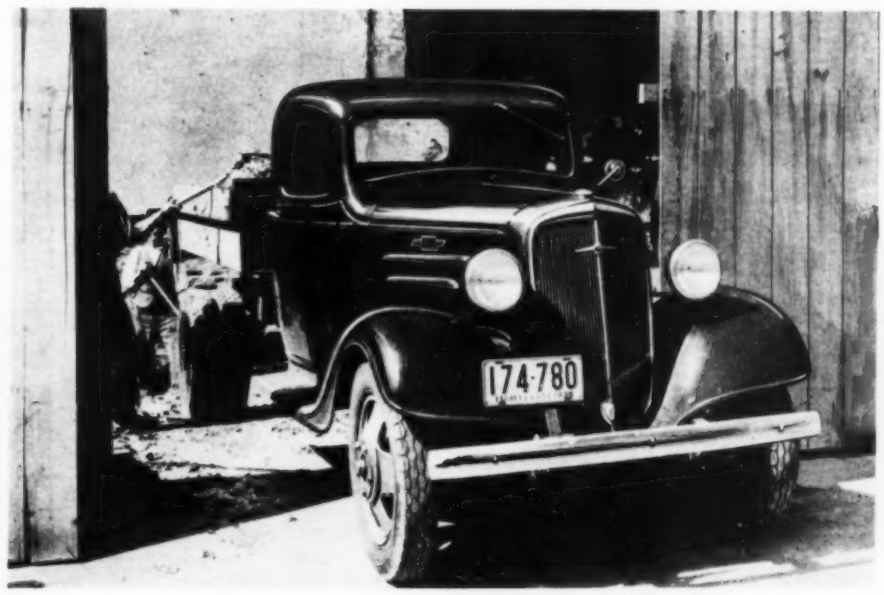
Entire test conducted under supervision of A.A.A. Contest Board—Sanction No. 3300.

CHEVROLET

NEW PERFECTED HYDRAULIC BRAKES always equalized for quick, unswerving, "straight line" stops.

NEW HIGH-COMPRESSION VALVE-IN-HEAD ENGINE with increased power, increased torque, greater economy in gas and oil.

FULL-FLOATING REAR AXLE with barrel type wheel bearings on 1½-ton models.



The accompanying picture and record of this unusual test run with a Chevrolet truck give indisputable proof of every claim ever made for the power and economy of Chevrolet trucks.

Consider this remarkable demonstration of great pulling power and dollar-saving economy in terms of your own trucks. Chevrolet truck pulling power, the greatest of any truck in its price class, and Chevrolet valve-in-head engine economy and dependability are the answer to your haulage costs, too.

Get the facts with trial loads—your kind of loads—under conditions that can leave no doubt concerning Chevrolet truck superiority for your haulage needs. Your Chevrolet dealer is ready to give you that test—at your convenience.

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN

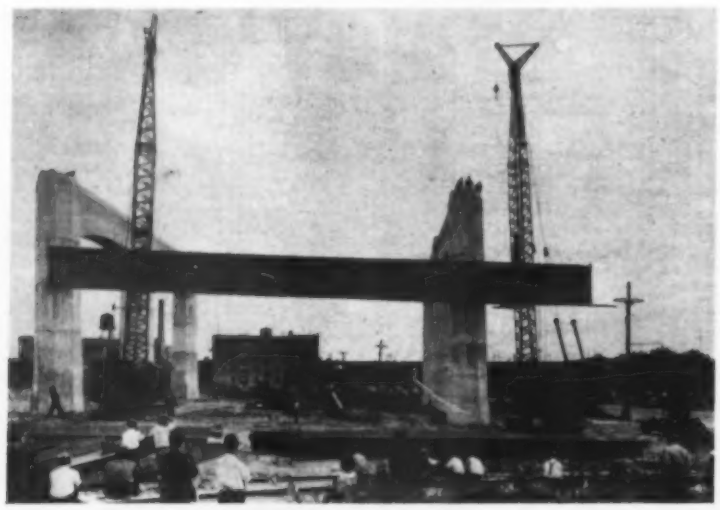
6% NEW MONEY-SAVING G. M. A. C. TIME PAYMENT PLAN
Compare Chevrolet's low delivered prices and low monthly payments.

SPEEDCRANES

with McClintic Marshall on

TRI-BOROUGH BRIDGE

A SPEEDCRANE placing 34-ton girder 96′ long 72′ above ground, requiring only 2 to 3 minutes from start of lift to placement.



Two SPEEDCRANES lifting 61-ton, 128′ girder at 19′ radius. These machines are equipped with 80′ main booms and 20′ cantilever jibs.

WHY leading contractors select them:

Greater speed and ease of operation

Larger lifting capacity

Positive and accurate control of load

Ability to handle long booms

Rugged construction, low maintenance

Gas, diesel, or electric driven

Readily convertible for dragline, trenchoe, or shovel work at minimum cost.

Write us for catalogue and information.

MANITOWOC ENGINEERING WORKS

Manitowoc, Wisconsin

NATIONAL CARBIDE

V-G LIGHTS

Most Light
from least Carbide
Quickly Charged

Easily moved—No wires
No Burner Troubles

No waste Carbide whether used continuously or intermittently
No harm done if tipped over

—

Extension to
X-100
DOUBLES THE
CANDLE POWER
fastens anywhere

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Always use
NATIONAL
CARBIDE
"In the Red Drum"
Distributors
Coast to Coast

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WRITE FOR
COMPLETE
INFORMATION

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Y199
NATIONAL CARBIDE V-G HANDY LIGHT
Burns about 5½ hours on 1¾ lbs. of 14-ND Carbide, 2 gals. water; delivers about 1500 c.p. Weighs 37 lbs. charged—easy to carry, handy in emergencies.

WL1-C1
NATIONAL CARBIDE LANTERN
Burns 8 hrs. on 8 oz. of Carbide. Brilliant rear signal of red, blue or green, no extra charge . . . Ideal for emergency lighting on road at night.

X-100
NATIONAL CARBIDE V-G LIGHT
About 8,000 c.p. for 12 hours on 7 lb. charge of National Carbide. Easily handled by one man. Weight 35 lbs. empty; 98 lbs. full.

NATIONAL CARBIDE SALES CORP.
LINCOLN BUILDING
Opposite Grand Central, NEW YORK

THERE IS WRIST ACTION IN THE
PORTER
SWIVEL HEAD CUTTER
The Swivel Head principle—of time-tested Porter design and construction—permits the head to swing in any degree, from in line with the handles, to a full right angle position on either side. It actually "bends to the job"—over, under and around obstructions. Full cutting power is maintained in every position. The most versatile cutter ever developed. Saves time and labor on all difficult jobs. Frees the operator from strain and awkward bending. Order from your supplier or write us for descriptive circular.
H. K. PORTER, INC.
EVERETT, MASS., U.S.A.
EST. 50 YEARS

500 Miles a Week for Years
WITHOUT A BLOWOUT!

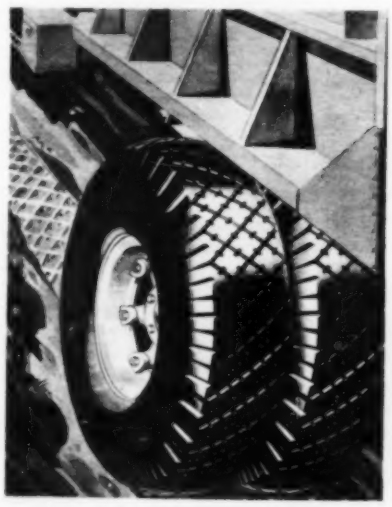
• Mr. J. P. O'CONNELL, *standing beside one of his General-equipped fleet of 33 transit mixers and dump trucks.*

• J. P. O'Connell Company of Boston, mason's supplies and ready mixed concrete, operate 33 transit mixers and dump trucks.

Shuttling back and forth, day and night, between plant and the job, mixing concrete as they run or hauling huge loads of sand, gravel and bags of cement—demands tires that can "take it".

The transit mixers frequently run 72 hours at a stretch with relays of drivers—and are doing it today, supplying concrete for the three million dollar bridge across Fore River between Quincy, Massachusetts, and Weymouth.

Under this extreme type of service, J. P. O'Connell Company have yet to have a blowout. The entire fleet is 100% General Tire equipped.



The General Heavy Duty Traction Balloon is made to order for the toughest construction jobs. It is only one of the complete line of Generals—each designed and built specifically to do a certain job better.

Your General Tire dealer has the most complete, most highly specialized line of truck tires in the business. He is a practical truck tire man with wide experience and accurate knowledge in fitting the right type and size of tire to every job. He can cut your costs. Let him prove these statements.

THREE REASONS WHY GENERALS ARE MORE PROFITABLE TO YOU

1. Generals are stronger tires—additional full width plies of powerful cord are anchored bead to bead—with no "idle" plies—no floating breaker-strips.

2. Generals are cooler tires—they flex uniformly without that heat-producing "hinging-action" of ordinary breaker-strip tires.

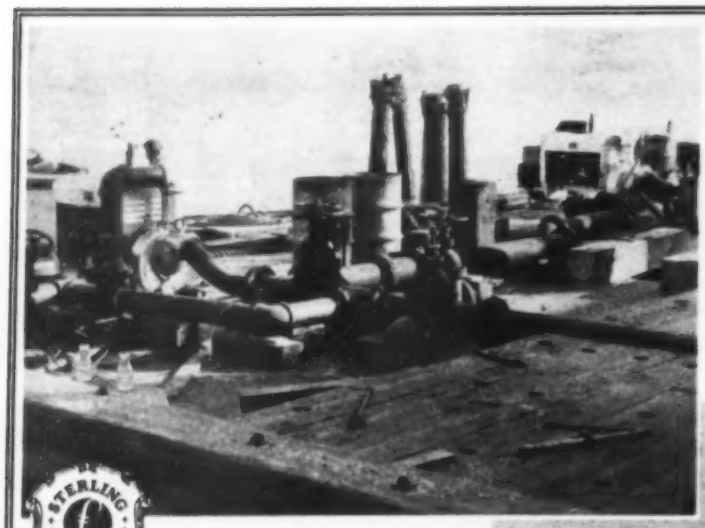
3. Generals have "compact rubber" treads—their construction keeps the tread rubber compact and compressed so that it wears slowly and gives more miles.

FREE

Read this booklet on how to avoid the more expensive tire troubles. Write to the General Tire and Rubber Co., Akron, Ohio.

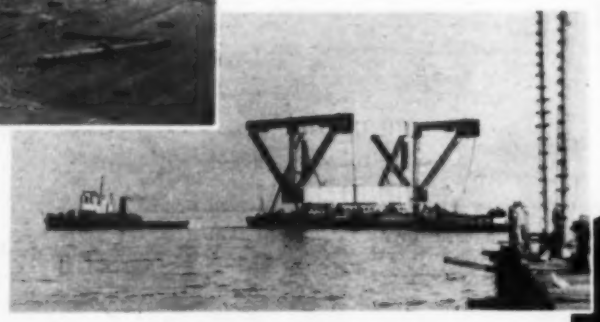
•

GENERAL TRUCK TIRES

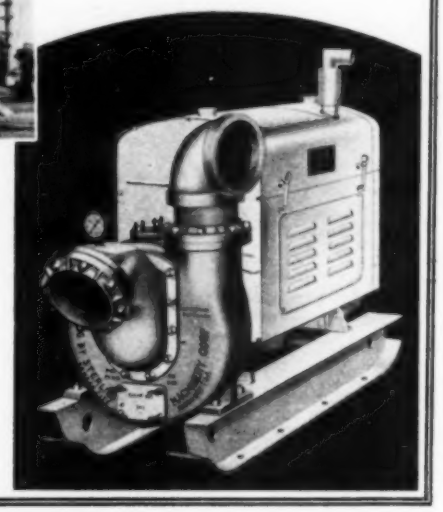


AMERICAN BRIDGE COMPANY Selects STERLING PUMPS for SAN FRANCISCO-OAKLAND BAY BRIDGE

American Bridge Company selected 6" Sterling Super Six Pumps for the vital task of pumping water in and out of the barges that carry steel for the decks of the big new San Francisco-Oakland Bay bridge. Upper illustration shows pumps mounted on barges and center Illustration shows a bridge section being moved into place. Jobs like this prove the true worth of Sterling Pumps. Dependability was a vital requirement for this important work so Sterling Pumps were selected—and they are living up to their name.



LOOK FOR STERLING PUMPS ON ALL THE BIG JOBS

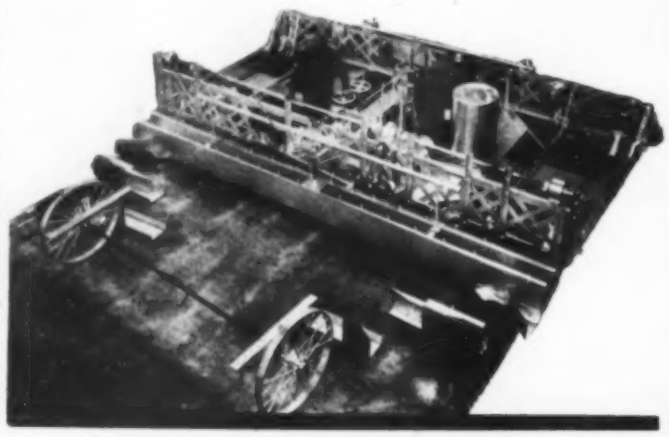


There's a reason why the largest contractors select Sterling Pumps for their most important jobs. They know that Sterling Pumps are built to withstand severe service. They know that Sterling Pumps are simple, easy to operate and above all, — DEPENDABLE. American Bridge Company engineers realize the value of good equipment and that's why they selected Sterling Pumps. Sterling's simplicity and dependability assuring successful performance means a lot to you too—specify Sterling.

Sterling
MACHINERY CORPORATION
411-13 Southwest Blvd. Kansas City, Mo.

WRITE FOR CATALOG

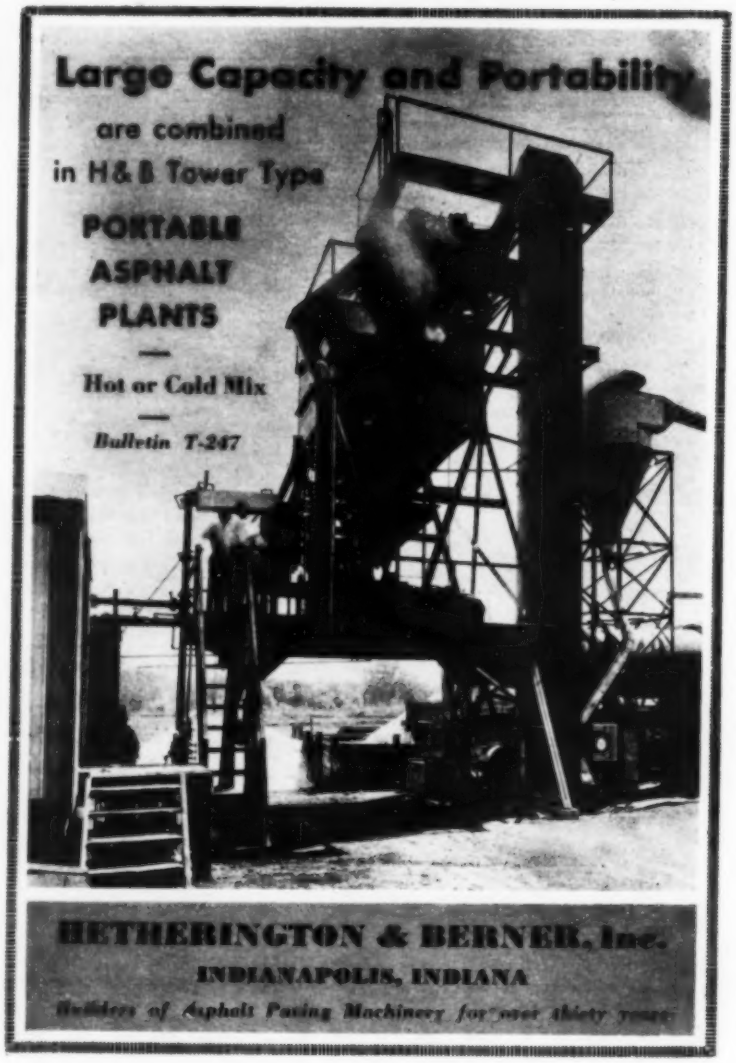
Send for the Big Sterling Catalog and bulletin of engineering data today. It's free for the asking.



PANAMA CANAL FINISHING MACHINE

This picture shows the FLEX-PLANE finishing machine selected in competition by the United States Government to build the Isthmus of Panama Highway. Advanced ideas were incorporated. This is the second FLEX-PLANE finisher purchased for building the Isthmus road.

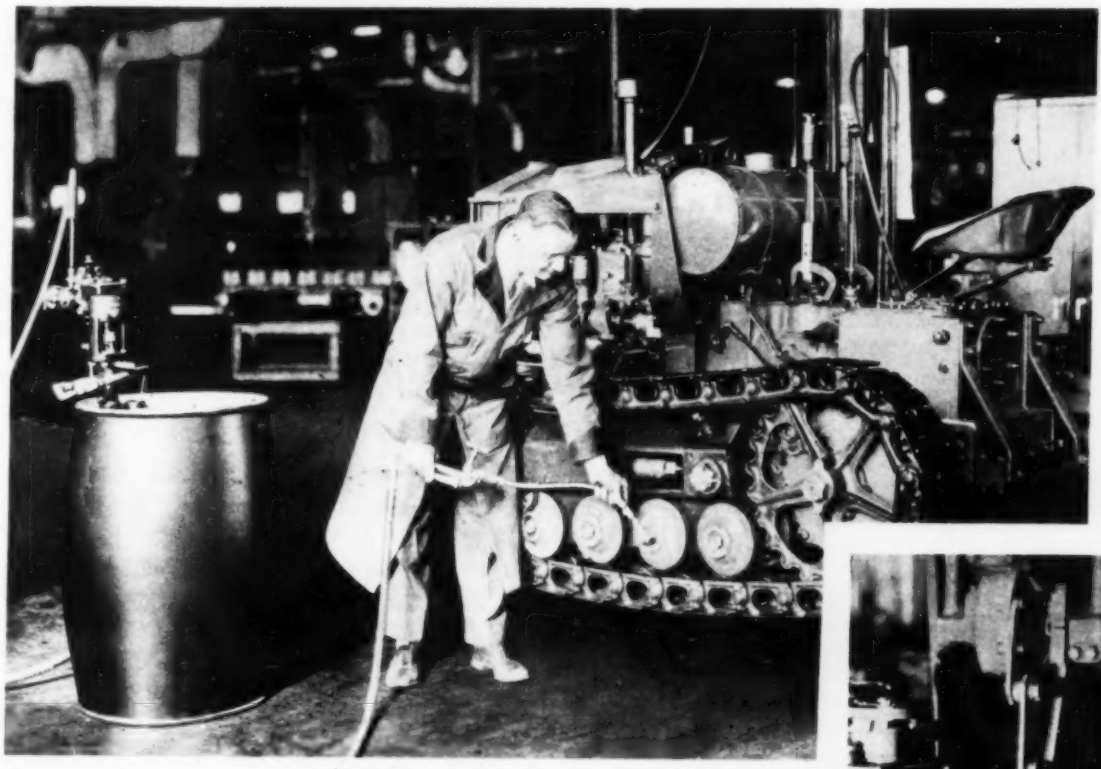
FLEXIBLE ROAD JOINT MACHINE CO.
WARREN, OHIO



HETHERINGTON & BERNER, Inc.
INDIANAPOLIS, INDIANA
Builders of Asphalt Paving Machinery for over thirty years

Because ALEMITE LUBRICATION "KEEPS 'EM ROLLING" AT LOW COST

—90% OF ALL MACHINERY *at the American Road Builders' Show in Cleveland was* ALEMITE EQUIPPED



● *Equipped with Alemite Giant Buttonhead System—the lubrication of the track roll mechanism on crawler-type tractors is simple, quick and sure. Whether you choose power-operated Alemite equipment or hand-operated guns—you'll save money on lubrication maintenance costs.*

● *For quick, clean, economical lubrication of vital bearing surfaces on all types of machinery you can depend on the positive action of the Alemite Hydraulic System. It saves time, labor and lubricant.*

WHETHER you lubricate your construction equipment in a centrally located garage or station, or whether lubrication work is done "on the job"—you can do it at ***lower cost*** and do it ***better*** with Alemite.

No matter what kind of work you are doing—for any type of machinery on any job—Alemite has a low-cost system that insures thorough lubrication and a complete line of extreme-pressure lubricants that can "stand the gaff" under any and all conditions.

Most new machinery comes equipped with Alemite, but you can get Alemite savings ***now*** by merely adopting this modern high-pressure lubrication system to equipment now in use. The change-over is simple—economies certain. Your dealer can give you complete details or you can write direct. In either case, and entirely without obligation, you'll get information that can save you as much as 25% on your maintenance costs. Act at once.

ALEMITE—*A Division of Stewart-Warner Corporation*
1840 Diversey Parkway Chicago, Illinois
Stewart-Warner-Alemite Corporation of Canada, Ltd., Belleville, Ontario, Canada

ALEMITE

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SOLVED

...ONE OF THE CONTRACTOR'S BIGGEST PROBLEMS

NEW INSLEY SEMI-TRAILER DUMP WAGON DOUBLES PAYLOAD CAPACITY

THINK of it — a new type of dump equipment that will haul TWICE as much dirt as any ordinary truck with dump body. It's the new Insley semi-trailer dump wagon with a capacity of 5 cubic yards and the ability to transport far bigger payloads in far less time and at far less cost. This unit was one of the big hits of the Cleveland Road Show because it solves one of the contractor's biggest problems. It will be to your advantage to write for complete specifications and prices.

INSLEY

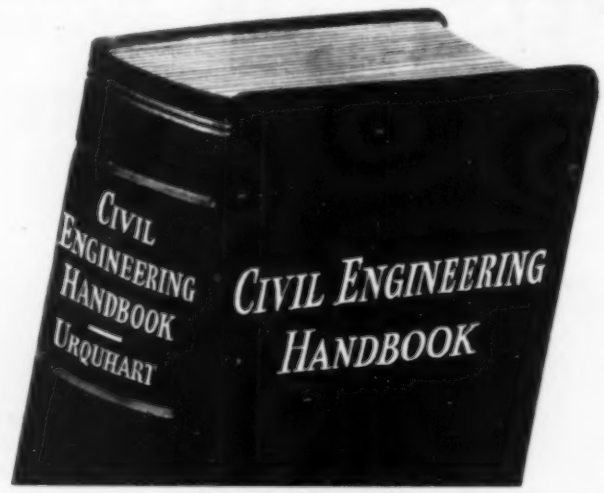
MANUFACTURING CORPORATION

Indianapolis Indiana

10 basic treatises

covering the entire field of civil engineering—emphasizing material needed by engineers—presenting adequate and usable treatments of essential topics.

In one new handbook at the low price of $5.00



Urquhart's

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UP-TO-DATE, authoritative, new in approach, this book makes available to civil engineers a manual of unusual value. In one volume it presents the fundamentals of the various subdivisions of civil engineering, for the use of practicing engineers, especially when confronted with problems outside their specialized fields. In each division a noteworthy specialist has contributed a compact treatise, developing fundamental theories as well as stating more involved ones, making the book not only a comprehensive reference work, but also adaptable for systematic study of any of the fields represented in it.

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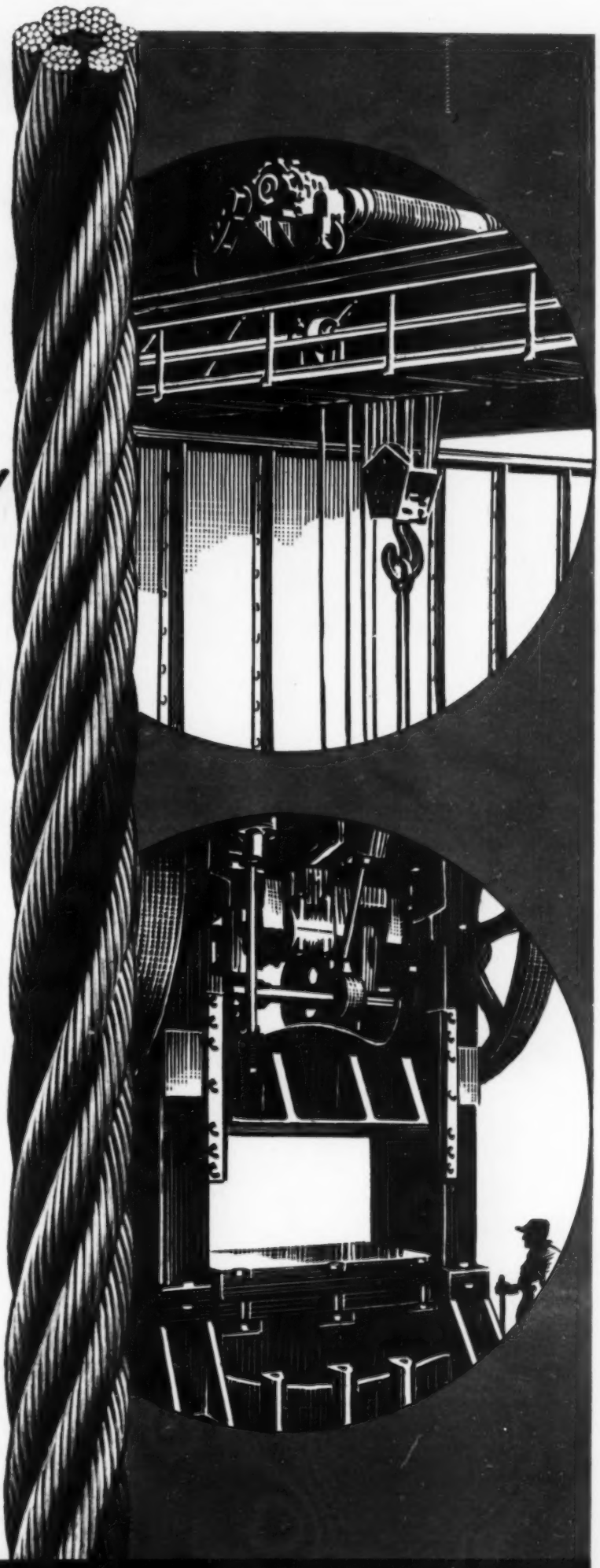
One good rope *deserves another!*



GREEN SIGNIFIES SAFETY

Three years ago the maintenance engineer of the .....*..... plant found that with TRU-LAY Preformed on his traveling crane the tendency of the rope to jump the sheaves was greatly reduced, all kinking was eliminated and the rope life was considerably longer.

His enthusiasm for TRU-LAY led a contractor (installing a 500-ton toggle press in this same plant) to change to TRU-LAY. Now, they both know TRU-LAY Preformed qualities, its resistance to kinking, its ease of handling, the elimination of broken wire hazards, and the value of its flexibility. Both men know that TRU-LAY Preformed saves a lot of time and trouble; makes a better profit.

It will pay you to investigate TRU-LAY Preformed.

*Name on request.

AMERICAN CABLE COMPANY, Inc.
Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Company, Inc.
In Business for Your Safety
District Offices: Atlanta, Chicago, Detroit, Denver, New York, Philadelphia, Pittsburgh, Houston, San Francisco

TRU·LAY *Preformed* Wire Rope

ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

COMPARE!

ARMOR-D HANDLE

ORDINARY HANDLE

Armor-D

The Perfect Shovel Handle

The cross-section view of an ordinary handle and of an Armor-D handle, illustrated at left, clearly shows why the Armor-D is a superior handle.

Note that in the Armor-D the wooden fork extends to the top of the handle, encased in an armor of steel reenforcing the natural strength of second growth Northern Ash. The ordinary shovel handle is just riveted on the end of the handle stem — merely an extension.

The Armor-D gives protection against weathering, checking and splintering. Patented rivet clips lock and hold the grip secure. The only grip that wear cannot loosen. Specify Armor-D — the most perfect handle yet made.

There is no wobble to an Armor-D

ASK YOUR JOBBER

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SINCE 1774

AMES BALDWIN WYOMING CO.

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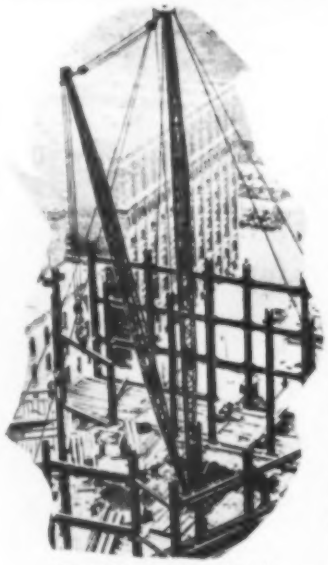
TRADE MARK
DOBBIE
ESTABLISHED 1862

All Steel DERRICKS



Steel Erectors Guy Derrick, with Ball Bearing Footblock.

Guarantee Safety

When you guarantee safety, you economize — for safety means uninterrupted operation and lowest possible maintenance costs.

And DOBBIE All-Steel Derricks have been designed for safety and consequent economy. They have a safe load capacity of almost twice their rating. You need this assurance of dependable safety and continuous performance.

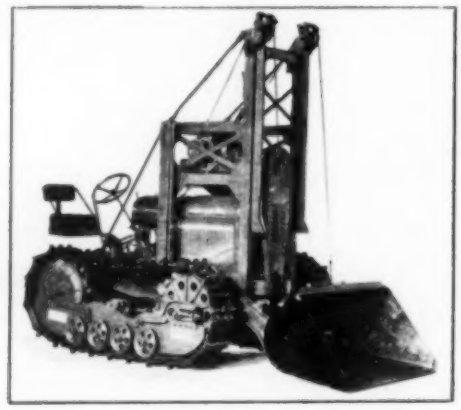
SAVE POWER BY USING BALL OR ROLLER BEARING FOOTBLOCKS AND SHEAVES. Built in both Guy and Stiff-leg types. Write for information and prices.

DOBBIE FOUNDRY & MACHINE CO.

Niagara Falls, N. Y.

Other Dobbie Products—Steel Derricks, Timber Derrick Fittings, Hand Winches, Motor Driven Winches, Blocks, Sheaves, etc.

LOW



COST

DIGGING and LOADING

This fast, portable, easily operated tractor shovel digs profits out of troublesome jobs. Use it for digging, loading, sub-grading, stripping, cleaning up, bulldozing, leveling, excavating, snow removal, etc. 3 heights, crawlers or wheels, 1/2 or 3/4-yd. buckets, bulldozer attachment. Write for Catalog O-8 to TRACKSON CO., Milwaukee, Wis., U. S. A.

TRACKSON
HIGH SHOVEL

Austin-Western Hydraulic Controls

SOME *Untold Facts*
THAT EVERY BUYER SHOULD KNOW

A FEW years ago, Austin-Western pioneered in equipping its road machinery with Hydraulic Controls. They were an immediate outstanding success.

The change over to Hydraulics involved many difficult mechanical and manufacturing problems. But being the pioneers brought us some very important advantages. There was no reason to hurry—no competitive pressure—no impatient buying public.

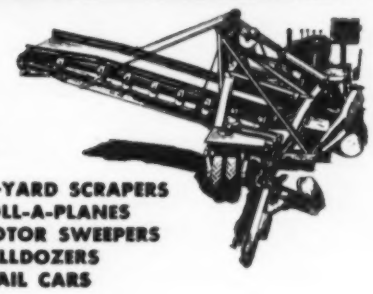
Austin-Western took its time—plenty of time. Still more laboratory tests! Still more practical tests! Announcement to the public was postponed more than once while further guarantees of success were established.

When finally announced that success was so complete from the very beginning as to be unique. To illustrate: One of the first orders filled was for 40 machines. Today, the buyer of those machines reports the Hydraulic Control mechanism is and has always been in perfect condition.

You can always be sure of the Hydraulic Controls on Austin-Western machinery. The extra time that went into their development plus the greater length of time they have been on the market may well be the deciding factor in your choice at buying time.

The Austin-Western Road Machinery Co.
Home Office: Aurora, Ill. Cable Address: AWCO, Aurora
Branches in 14 Principal Cities

Hydraulically Controlled A-W Equipment



ROAD GRADERS	12-YARD SCRAPERS
MOTOR GRADERS	ROLL-A-PLANES
GIANT RIPPERS	MOTOR SWEEPERS
TRAIL BUILDERS	BULLDOZERS
ELEVATING GRADERS	TRAIL CARS

Austin-Western

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ROAD ROLLERS · DUMP WAGONS · DUMP CARS
SCARIFIERS · BULLDOZERS · TRAILERS · SCRAPERS · PLOWS
BITUMINOUS DISTRIBUTORS · ROAD-MIX MACHINES · CULVERTS
CRUSHING AND WASHING PLANTS · SWEEPERS AND SPRINKLERS · SHOVELS · CRANES · ETC · SNOW PLOWS

The Austin-Western Road Machinery Co.
A-6, Aurora, Illinois
Please send details on .....
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Name 612-C
Address .....
City ..... State .....

AND SO COMES MARCH . . . THE MONTH OF ACTION

MARCH						
SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Here and there a thaw—promises of Spring—and a warning that there is not too much time left to check on your equipment needs.

Fast moving jobs call for modern equipment. Toil-worn cranes and work-weary shovels cannot produce the yardage needed to keep apace with today's resurgence of construction activity. New and modern machines are the order of the day and to hold your place in the ranks of the successful bidders you must see that your equipment is up-to-date.

And in checking your needs, don't overlook the "AMERICAN" line. Shovels - cranes - draglines - revolving cranes - locomotive cranes - hoists - derricks - all skillfully engineered, made of the best materials, and backed by more than a half-century of experience in manufacturing construction equipment. Send for catalogs today.

AMERICAN HOIST & DERRICK COMPANY
SAINT PAUL, MINNESOTA

AMERICAN GOPHER SHOVELS SINCE 1903

AMERICAN Gopher SHOVELS
CRANES · DRAGLINES

SELF-EXPANSION does it!

NOW... even OLD ROADS can be freed from costly joint maintenance... paving repairs minimized

INTRODUCING SE (Self-Expanding) Cork Joint, Johns-Manville offers *the first joint that is self-expanding after installation!*

And SE Cork is capable of enough expansion to fill the slot *at all times* . . . hence preventing the entrance of water and foreign materials.

Dehydration during manufacture and pre-compression at the factory reduce SE Cork to about 60% of its original thickness. *And SE Cork Joint does not begin to regain its thickness until moisture is again absorbed.*

A water-resistant wrapping prevents expansion until after installation, when moisture is taken from the air or concrete.

Replacement on existing pavements with SE Cork means the permanent elimination of extruding joint materials and consequent maintenance costs. More important—since foreign materials can never get in to start their work of destruction, SE Cork provides lasting protection for your concrete roads, streets, curbs and sidewalks.

And, of Course, on New Roads

Economy on new paving goes beyond first costs. It must include future maintenance. Write off joint maintenance on new construction, reduce upkeep on the road itself by specifying SE Cork Joint.

For our brochure covering both Standard and SE (Self-Expanding) Cork Joint, write to Johns-Manville, 22 E. 40th St., N. Y. C.

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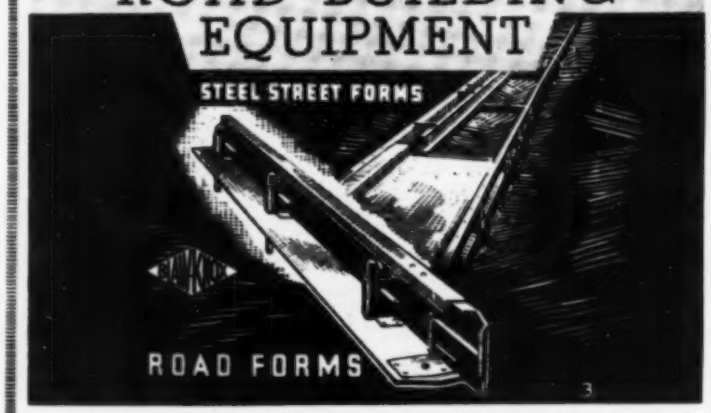
SE CORK EXPANSION JOINT

BLAW-KNOX ROAD BUILDING EQUIPMENT



New developments and improvements in Blaw-Knox Construction Equipment are right in step with today's program.

With a background of years of practical experience, Blaw-Knox equipment is trustworthy. It is economical and low in maintenance. Designed to stand up under severe operating conditions, it is fitted to the job by skilled engineers. It helps immeasurably to fulfill contracts speedily and profitably.

BLAW-KNOX COMPANY, 2086 Farmers Bank Building, Pittsburgh, Pa.
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BLAW-KNOX ROAD BUILDING EQUIPMENT
Includes:
BATCHERPLANTS · ROAD FINISH-SPREADERS
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(Gas-Electric) · CONCRETE BUCKETS
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Literature on any of the above BLAW-KNOX Products will be sent

MODERNIZE YOUR TRANSPORTATION EQUIPMENT

● *One of a fleet of 7 Model "87Q" Hugs equipped with a 7-yard barrel type body of special Hug construction, built for the Georgia Limerock Co., Perry, Ga.*

WITH HUGS

● 1936 is a year for modernization—in methods and in equipment. Start your modernization program with your *transportation* equipment by putting Hug Roadbuilders on the job. Moving dirt and rock products with Hugs gives you greater mobility and flexibility — at lower cost per yard. You'll see the results in faster hauling of bigger pay-loads at less expense per mile.

Fast, low-cost moving of dirt, quarry and rock products on tough jobs calls for equipment specially built to meet the conditions. Ordinary dump trucks just won't do. You must have trucks with real guts—trucks that will come through every time, no matter how tough the conditions, and then race back for more.

Hug Roadbuilders have everything! They are especially built to meet and withstand the toughest conditions, they have the ruggedness needed for the hardest dirt and rock moving operations. Hugs stay on the job year after year!

Tell us about your transportation needs. Let our engineers study your individual requirements and recommend specially designed and built Hug equipment.

HUG

THE HUG COMPANY
550 Cypress Street • Highland, Illinois

BUILT TO MEET A CONDITION

In 1936

ADVERTISING *faces its Golden Opportunity to sell* Industry's 12 Major Markets

THE flood gates of recovery in the capital goods industries are open. Plants are being modernized, re-equipped, rebuilt, enlarged. In the past few months, for instance, the machine-tool business has risen from practical stagnation to a double-shift basis. Where depression-thinking whispered, "Keep your cash reserves intact," recovery-thinking today commands, "Spend money now for modernization. Profits await those who can produce for less and sell for less in 1936."

Now is the time to use every available sales tool. The heavy

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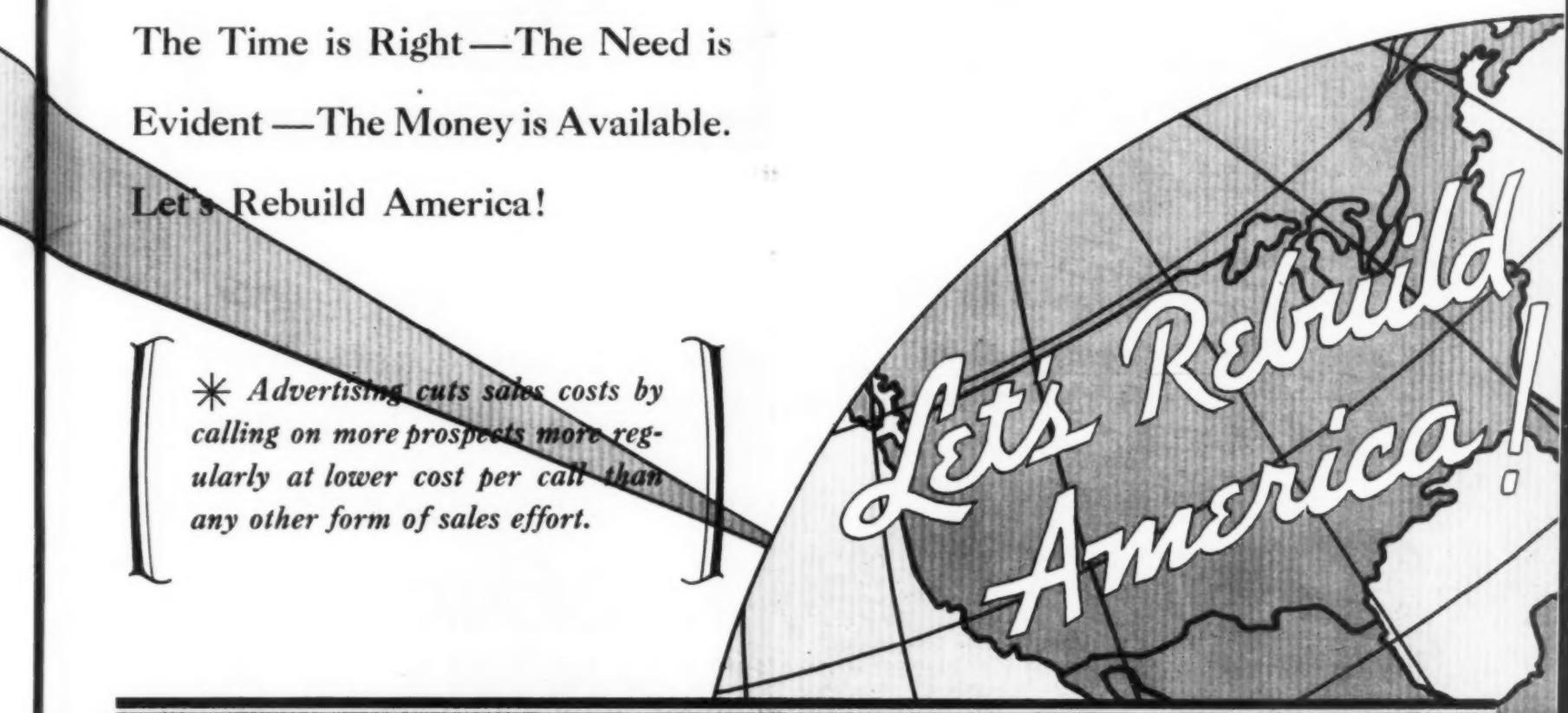
industries are swinging into a mass-production tempo which calls for greater use of that mass-production sales tool, business paper advertising. The right amount of the right kind of business-paper advertising will get you your share of the rapidly expanding volume of orders now being placed. ✳

McGraw-Hill representatives have the facts. Better get them now—and get a running start on 1936 business in Industry's 12 Major Markets.

The Time is Right—The Need is Evident—The Money is Available.

Let's Rebuild America!



✳ Advertising cuts sales costs by calling on more prospects more regularly at lower cost per call than any other form of sales effort.

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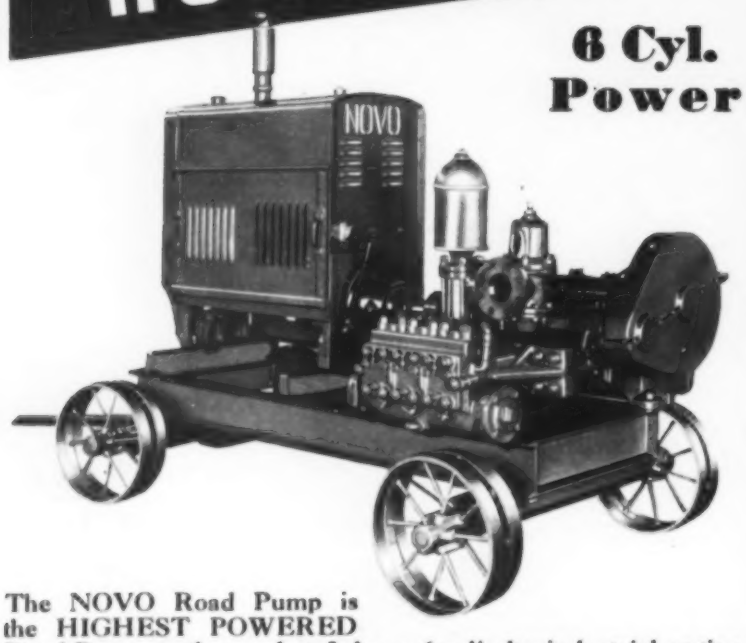
Transit Journal

NOVO
HIGH POWERED *high pressure* ROAD PUMP

6 Cyl. Power



The NOVO Road Pump is the HIGHEST POWERED Road Pump on the market. It has a 6-cylinder industrial engine with a 3", 7-bearing crankshaft—develops 40 to 55 H. P.—will push plenty of water over the hill to the paver and have ample to spare for all curing, jetting and sprinkling operations.

The Patented NOVO Water Governor—
- Unloads Pump and Engine when no water is being used.
- Reduces operating expense.
- Operates at low pressure as well as high.
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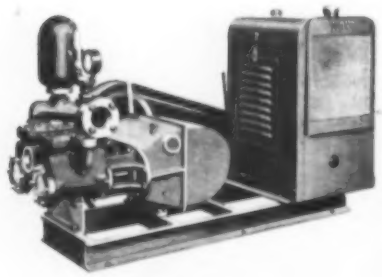

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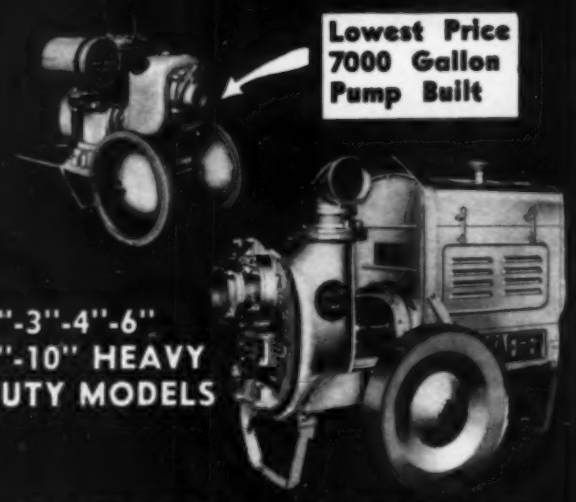

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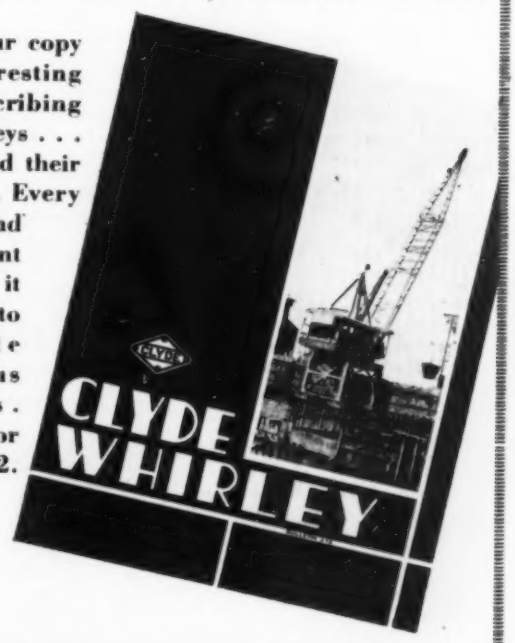

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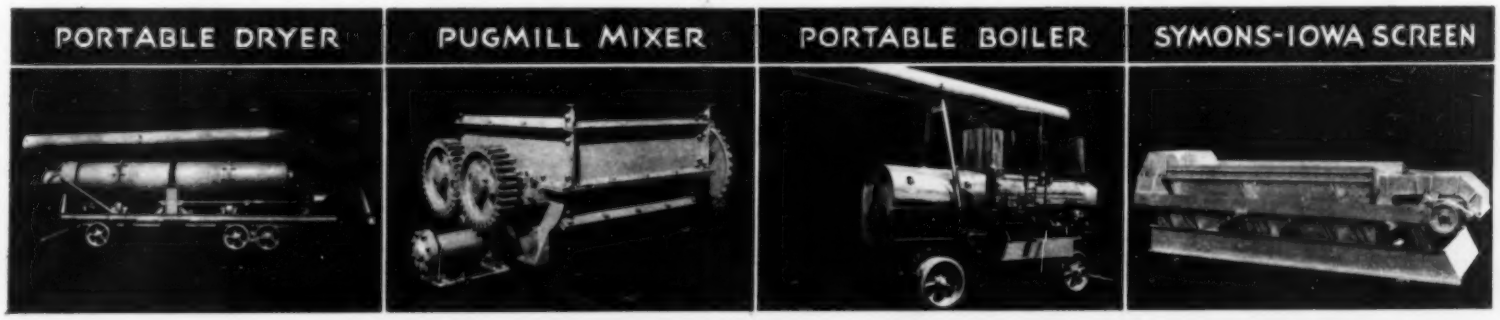

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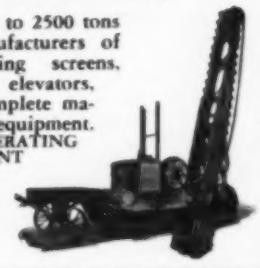

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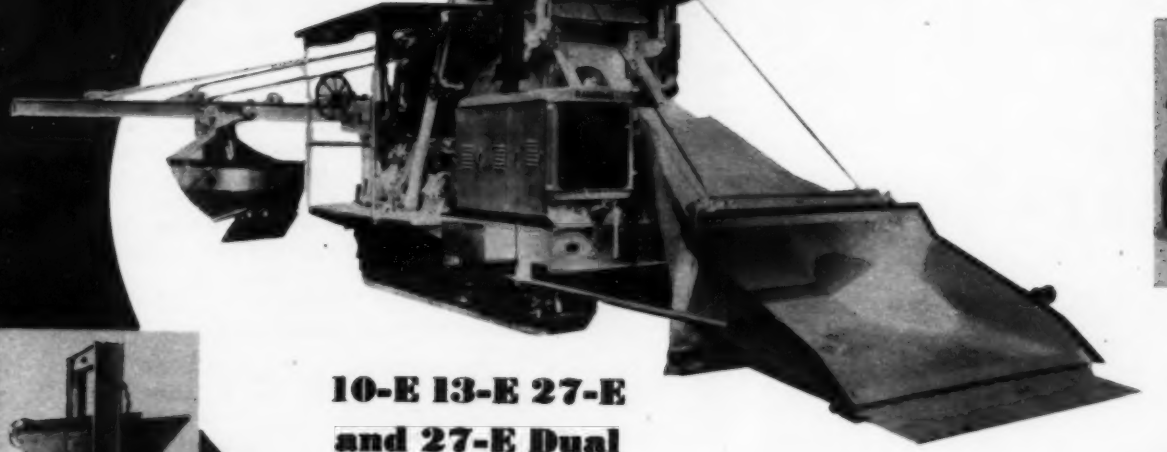

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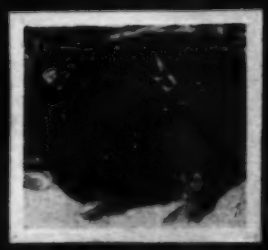

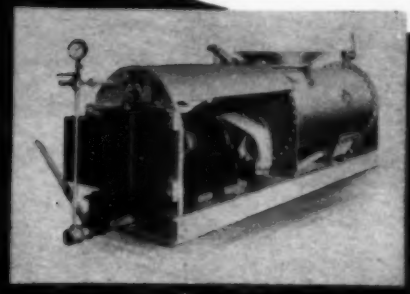

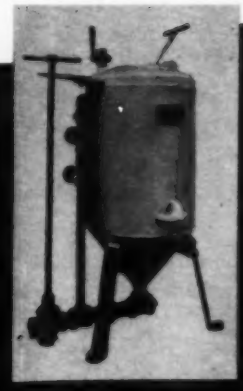

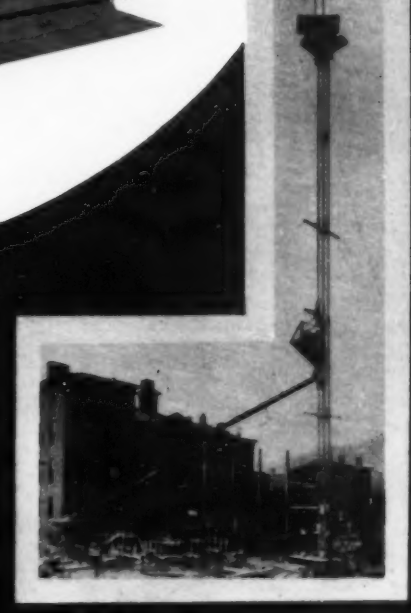

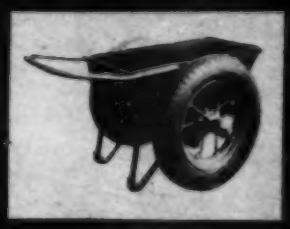

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